ASSOCIATION

OF

Railway Telegraph Superintendents.

PROCEEDINGS

OF THE

ANNUAL MEETING HELD AT NIAGARA FALLS, N. Y.,

June 16th and 17th, 1897.

CONSTITUTION, BY-LAWS, LIST OF MEMBERS, ETC.

MILWAUKEE:
J. H. YEWDALE & SONS CO., PRINTERS,
1897.

ANNOUNCEMENT.

This Association was formed in Chicago, November 20, 1882. Its object is the improvement of the railway telegraph service.

The next annual meeting will be held at Hot Springs, S. D., June 15, 1898.

The undersigned will be glad to answer any inquiries in reference to the Association.

J. W. LATTIG, *President,*
So. Bethlehem, Pa.

W. W. RYDER, *Vice-President,*
Chicago, Ill.

P. W. DREW, *Sec'y and Treas.,*
Milwaukee, Wis.

THE ASSOCIATION

. . OF . .

RAILWAY TELEGRAPH SUPERINTENDENTS.

CONSTITUTION AND BY-LAWS.

1882.

W. K. Morley.....President.
Wm. Klein .....Vice-President.
C. S. Jones.....Secretary.

1883.

W. K. Morley.....President.
C. Selden .....Vice-President.
P. W. Drew.....Sec'y and Treas.

1884.

C. Selden .....President.
E. C. Bradley.....Vice-President.
P. W. Drew.....Sec'y and Treas.

1885.

C. W. Hammond.....President.
Geo. L. Lang.....Vice-President.
P. W. Drew.....Sec'y and Treas.

1886.

A. R. Swift.....President.
Geo. L. Lang.....Vice-President.
P. W. Drew.....Sec'y and Treas.

1887.

Geo. L. Lang.....President.
Geo. C. Kinsman.....Vice-President.
P. W. Drew.....Sec'y and Treas.

1888.

Geo. C. Kinsman.....President.
C. A. Darlton.....Vice-President.
P. W. Drew.....Sec'y and Treas.

1889.

C. A. Darlton.....President.
G. T. Williams.....Vice-President.
P. W. Drew.....Sec'y and Treas.

1890.

G. T. Williams.....President.
G. M. Dugan.....Vice-President.
P. W. Drew.....Sec'y and Treas.

1891.

C. S. Jones.....President.
L. H. Korty.....Vice-President.
P. W. Drew.....Sec'y and Treas.

1892.

L. H. Korty.....President.
U. J. Fry .....Vice-President.
P. W. Drew.....Sec'y and Treas.

1893.

U. J. Fry.....President.
O. C. Greene.....Vice-President.
P. W. Drew.....Sec'y and Treas.

1894.

O. C. Greene.....President.
E. R. Adams.....Vice-President.
P. W. Drew.....Sec'y and Treas.

1895.

M. B. Leonard.....President.
J. W. Fortune.....Vice-President.
P. W. Drew.....Sec'y and Treas.

1896.

G. M. Dugan.....President.
J. W. Lattig.....Vice-President.
P. W. Drew.....Sec'y and Treas.

1897.

J. W. Lattig.....President.
W .W. Ryder.....Vice-President.
P. W. Drew.....Sec'y and Treas.

LIST OF MEMBERS.

NAME.	RAILROAD.	ADDRESS.
J. W. Lattig	Lehigh Valley	So. Bethlehem, Pa.
G. M. Dugan	Illinois Central	Chicago, Ill.
O. C. Greene	Northern Pacific	St. Paul, Minn.
U. J. Fry	C., M. & St. P.	Milwaukee, Wis.
L. H. Korty	Union Pacific	Omaha, Neb.
Geo. T. Williams	95 N. Perry St	Cleveland, Ohio.
C. A. Darlton	Southern	Washington, D. C.
G. C. Kinsman	Wabash	Decatur, Ill.
Geo. L. Lang	C. N. O. & T.	Lexington, Ky.
A. R. Swift	C., R. I & P.	Chicago, Ill.
C. W. Hammond	Missouri Pacific	St. Louis, Mo.
C. Selden	Baltimore & Ohio	Baltimore, Md.
G. H. Thayer	C. & N. W.	Chicago, Ill.
E. E. Torrey	Michigan Central	Detroit, Mich.
W. W. Ryder	C., B. & Q.	Chicago, Ill.
H. C. Hope	C., St. P., M. & O.	St. Paul, Minn.
C. S. Rhoads	C., C., C. & St. L.	Indianapolis, Ind.
Horace Johnson	B. & O. S. W.	Cincinnati, Ohio.
H. C. Sprague	K. C., Ft. S. & M.	Kansas City, Mo.
M. Magiff	Central Vermont	St. Albans, Vt.
A. B. Taylor	West Shore	New York.
R. Stewart	C. R. R. of N. J.	Jersey City, N. J.
S. K. Bullard	M., K. & T.	Sedalia, Mo.
P. W. Drew	Wisconsin Central	Milwaukee, Wis.
G. E. Evans	L. & N.	Louisville, Ky.
C. G. Sholes	A., T. & S. F.	Topeka, Kan.
K. McKenzie	M. & O.	Jackson, Tenn.

NAME.	RAILROAD.	ADDRESS.
L. B. Foley	D. L. & W.	New York.
H. T. Simpson	C. & O.	Richmond, Va.
W. F. Fox	M. & St. L.	Minneapolis, Minn.
E. A. Chenery	T. R. R. Association.	St. Louis, Mo.
J. S. Evans	N. Y. C. & St. L.	Cleveland, O.
W. F. Taylor	Penna. R. R.	Altoona, Pa.
W. J. Holton	Chi. & West Ind.	Chicago, Ill.
E. A. Smith	Fitchburg	Boston, Mass.
C. P. Adams	Great Northern.	St. Paul, Minn.
M. A. Baker	St. L., K. & N. W.	Hannibal, Mo.
I. T. Dyer	K. C., St. J. & C. B.	St. Joseph, Mo.
W. C. Walstrum	N. & W.	Roanoke, Va.
F. S. Spafard	B., C. R. & N.	Cedar Rapids, Iowa.
J. P. Boyle	K. & W.	Keokuk, Iowa.
J. M. Egan	St. L. & S. F.	Springfield, Mo.
W. P. McFarlane	F., E. & M. V.	Omaha, Neb.
R. J. M. Danley	Marietta	Marietta, Ohio.
A. R. Lingafelt	C., R. I. & P.	Topeka, Kan.
C. F. Annett	Illinois Central.	Chicago, Ill.
N. McKinnon	T., St. L. & K. C.	Toledo, Ohio.
L. S. Wells	L. I. R. R.	Long Island City, N. Y.
D. H. Caldwell	N. Y., C. & St. L.	Ft. Wayne, Ind.
G. B. McCoy	Illinois Central.	Memphis, Tenn.
H. B. Ware	B. & M. R.	Wymore, Neb.
W. F. Packard	C., H. & D.	Lima, Ohio.
H. A. Tuttle	M., St. P. & S. S.	Minneapolis, Minn.
J. R. Michaels	St. P. & D.	St. Paul, Minn.
F. A. C. Ferguson	Miss. Valley.	Wilson, La.
H. N. Daniell	L. Valley.	Sayre, Pa.
J. A. Frates	Illinois Central.	Jackson, Tenn.
J. H. Louy	C., H. & D.	Lima, Ohio.
S. A. D. Forestall	B. & M.	Boston, Mass.
E. E. Rittenhouse	A., T. & S. F.	Deming, N. M.
F. B. Gee	C., C. C. & St. L.	Cleveland, Ohio.
W. H. Lovekin	T. & O. C.	Toledo, Ohio.
W. F. Williams	S. A. L.	Portsmouth, Va.
S. B. Grimshaw	D. & R. G.	Denver, Colo.
W. S. Glover	C., B. & Q.	Beardstown, Ill.
G. W. Gillespie	Illinois Central.	Champaign, Ill.
E. Dailey	Illinois Central.	Waterloo, Ia.

HONORARY MEMBERS.

Thos. A. Edison.
C. E. Topping.
E. M. Herr.
S. K. Blair.
H. F. Houghton.
F. W. Dow.
T. J. Higgins.
Ralph W. Pope.
J. C. Ford.
C. H. Smith.
W. P. Ward.
J. J. Burnes.
Dr. Louis Duncan.
Chas. W. Bradley.
G. Bogart.
J. B. Stewart.
A. Hayward.
W. D. Vincent.
Albert Briggs.
A. J. Earling.
W. L. Blair.
Geo. C. Maynard.
W. K. Morley.
G. E. Simpson.
C. N. Chevalier.
J. H. Hill.
N. B. Patterson.
J. J. Dickey.
T. D. Lockwood.
D. K. Smith.
L. Horton, Jr.
W. S. Logue.
D. McNab.
C. B. Davidson.
W. C. Brown.
Geo. W. Stevens.
J. G. Hartigan.
F. W. Wilson.
W. M. Greene.
Sumner J. Collins.
W. G. Collins.
F. S. Gannon.
J. N. Ross.
S. S. Bogart.
C. F. Wilcox.
J. B. Shaw.
W. W. Nichols.
W. A. Gardner.
T. R. Taltavall.
H. C. Reed.
F. M. Duncan.
H. N. Rowell.
J. H. Guild.
G. N. Gish.
Jabez T. Odell.
Geo. M. Hohl.
C. A. Parker.
J. W. Fortune.
C. M. Halstead.
W. J. Murphy.
W. D. Ewing.
C. D. Gorham.
J. H. Barron.

CONSTITUTION.

ARTICLE I.

TITLE.

The organization shall be known as "The Association of Railway Telegraph Superintendents."

ARTICLE II.

OBJECT.

The object of this Association shall be: "The Improvement of the Telegraph Service," and the promotion and advancement in general of the interests of the telegraph department of railroads.

ARTICLE III.

WHO MAY BE MEMBERS.

Anyone connected with the telegraph department of any railroad in the capacity of superintendent, assistant superintendent, chief dispatcher or division operator, may become a member of this Association by subscribing to the constitution and paying into the treasury $5.00 per annum and receiving a majority vote of the members present.

ARTICLE IV.

OFFICERS.

The officers of this Association shall be elected by ballot, and shall hold office for one year, or until their successors are chosen. They shall consist of a President, Vice-President, Secretary and Treasurer; the last two offices may be filled by one person. The officers of this Association shall constitute an Executive Committee.

ARTICLE V.

DUTIES OF OFFICERS.

President—The President shall preside at all meetings of the Association, and perform such other duties as are generally performed by that officer.

Vice-President—The Vice-President shall preside in the absence of the President, and when so acting shall be governed by the rules prescribed for that officer.

Secretary—The Secretary shall keep correct minutes of each meeting, and cause the same to be printed immediately after adjournment, and send to each member two copies of the same. He shall also notify the members, by circular, of the time and place of each meeting, and perform such other duties as may be required by the Executive Committee.

Treasurer—The Treasurer shall collect all moneys due the Association, giving his receipt therefor, pay all bills contracted for by it, upon the approval of the Executive Committee, and at each annual meeting render a detailed statement of the receipts and expenditures of the previous year, which statement shall be printed with the proceedings of the meeting at which it is presented. In order to meet expenses in excess of the receipts from annual dues, he shall levy a *pro rata* assessment upon the members of the Association.

ARTICLE VI.

VACANCIES.

In case of a vacancy in any office, it shall be filled for the remainder of the year by the Executive Committee.

ARTICLE VII.

MEETINGS.

Seven members shall constitute a quorum at any meeting.

AMENDMENTS TO THE CONSTITUTION.

This constitution shall be changed only by an amendment offered in writing at a regular meeting, one month's notice having been given to each member by the Executive Committee, and can only be adopted by an affirmative vote of two-thirds of the members present.

BY-LAWS.

1. The Executive Committee is authorized to declare applicants acting members previous to the annual meeting.

2. The annual meeting of this Association shall be held at such time and place as shall be designated by the majority vote of members at a previous meeting.

3. Special meeting may be held upon a call of the Executive Committee, when requested by seven or more members.

4. Any member who is in arrears in payment of dues ninety days after the annual meeting shall be considered suspended, and should dues not be paid on or before the succeeding annual meeting, his name shall be dropped from the roll of membership.

ORDER OF BUSINESS.

At all meetings the following shall be the order of business:

1. Election of New Members.
2. Reading the Minutes of Regular and Special Meetings.
3. Report of Treasurer.
4. Reports of Standing Committees.
5. Reports of Special Committees.
6. Election of Officers.
7. Miscellaneous Business.
8. Adjournment.

ASSOCIATION

OF

Railway Telegraph Superintendents.

PROCEEDINGS

OF THE

ANNUAL MEETING HELD AT NIAGARA FALLS, N. Y.,

June 16th and 17th, 1897.

CONSTITUTION, BY-LAWS, LIST OF MEMBERS, ETC.

MILWAUKEE:
J. H. YEWDALE & SONS CO., PRINTERS,
1897.

TREASURER'S REPORT.

Received for dues	$305 00
Received for extra copies of minutes	4 50
Received for badges, Ft. Monroe	14 00
	$323 50

Expended—Notes of annual meeting	$ 44 75
" Printing minutes	96 00
" Printing service cards	16 50
" Printing notices	4 25
Postage and exchange	16 52
Secretary's salary for 1895-6	85 48
Account Secretary's salary 1896-7	60 00
	$323 50

Due Secretary, $90.00.

Respectfully submitted,
P. W. DREW,
Treasurer.

Secretary: Mr. President, I have a number of communications, which ought to be read, from President Dugan, Supt.'s Greene, Hope, MacKenzie and others, who are unavoidably detained and cannot be with us.

(Communications read.)

Chairman: The next order of business is the election of new members.

Secretary: I submit the following names:

H. T. Simpson, Supt. Telegraph, C. & O. R. R.

W. S. Glover, Chief Dispatcher, C. B. & Q. R. R.

G. W. Gillispie, Chief Dispatcher, Ill. Central R. R.

E. Dailey, Chief Dispatcher, Ill. Central R. R.

These four names are offered for membership; now are there any others?

Moved that the name of L. D. Jones, Chief Dispatcher, C. C. C. & St. L. R. R., Springfield, Ohio, be offered.

Mr. Fry: I move that they be accepted.

Motion seconded and carried.

Chairman: The next order of business is the reports of special committees, but there are no special committees except on Line Construction.

It is my impression that
until this evening a great m
ent will have arrived. It is b
to reach the city.

On motion the Associati

Meeting called to order
in the chair; the following be

J. W. Lattig,	W. W. Ryde,	
Chas. Selden,	M. Magiff,	W. Baker,
A. R. Swift,	Horace Johnson,	W. F. Williams,
P. W. Drew,	C. G. Sholes,	C. A. Daveton,
G. L. Lang,	S. K. Bullard,	E. D. Warner,
G. C. Kinsman,	A. P. Eckert,	G. B. McCoy,
U. T. Fry,	A. B. Taylor,	L. B. Foley,
E. A. Smith,	J. S. Evans,	J. W. Fortune,
H. N. Daniell,	W. S. Logue,	D. C. Bunnell,
F. B. Gee,	J. B. Taltavall,	Dr. P. L. Clark,
C. I. Rhoads,	T. R. Taltavall,	W. S. Eckert,
	T. D. Lockwood,	

Also following ladies: Mesdames Swift, Drew, Kinsman, Ryder, Magiff, Johnson, Evans, Williams, McCoy and Foley; Misses Magiff, Annett, Kinsman and Williams.

President: The next order of business is the report of standing committees. I believe we have a committee on Standard Line Construction. Are there any members here? Mr. W. F. Taylor is the Chairman of that committee. He is not present, and we have not heard anything from him. I do not think that any of the other members have any report.

Secretary: Move that that committee be continued.

President: Messrs. Sprague and Smith were on that committee. Mr. Smith is in the far west.

President: Is there any second to that motion?

Moved and seconded that the Committee on Standard Line Construction be continued. Carried.

President: We have a Committee on Arrangements. I believe I was the Chairman of that committee.

(Report read.)

Mr. Swift: I would offer a motion that a committee be appointed to wait on the ladies as soon as they can, and invite the ladies to come in and listen to the papers and the decisions of the committee and the discussions. They are waiting on the verandah, I believe, to be invited, not knowing the meeting is in session. I move that they be invited to come in.

President: If there is no objection the Chair will appoint Mr. Swift as a member of that committee.

Mr. Swift: I would suggest for the committee Mr. Selden, Mr. Lockwood and Mr. Kinsman, as they are some of the handsomest men here, to come with me to invite the ladies in here.

President: The suggestion is accepted.

President: What are your wishes in regard to the Committee on Arrangements? There is one thing I would like to have settled here to-night, if possible, that is, when do you wish to take this trip down the Gorge road? We ought to give a little notice in advance so that the officers of the company may be able to provide special cars as they have agreed to do; and we have been offered the same terms for a trip on the Canadian side of the river.

Both invitations were accepted, but it was decided not to go in a body, members to go when it best suited their convenience.

Secretary: There was a Special Committee appointed Mr. President, which ought to have precedence. You know that during the past year we have lost by death three members, two very prominent ones, one not so well known. I allude to our ex-President, M. B. Leonard, Mr. R. B. Gemmell, and Mr. J. G. Pinkerton, who was accidentally killed on his road a few months ago in Mississippi. I suggested to the President, Mr. Dugan, that he appoint a committee to draw up suitable resolutions in regard to the death of these members. I understood him to say he had appointed such a committee with Mr. Annette as

Chairman. If his report is ready I think it would be well to offer it for disposition.

Mr. Annette: I have no report, but we have here in session Mr. Seldon and the rest of the Committee to draw up these resolutions. I will offer them later.

President: The next order of business is the election of officers, but I believe the majority of the members are in favor of having some papers read this evening. If there is no objection we will proceed with the reading of the said papers.

Mr. Swift: I approve that and would offer a motion that the papers of Mr. Korty, Mr. Kinsman, Mr. Selden and myself be offered this evening, and that the paper of Mr. Lockwood, which is a very elegant but lengthy paper, and will require an extensive argument from Mr. Lockwood and members, be deferred until our next meeting to-morrow morning, and that the shorter papers (and I believe that most of them are not lengthy) be given this evening. The papers read this evening, the members, and especially our lady friends, would appreciate more than the detail papers of relays, pole setting and wire arrangement, and all that sort of thing. I would offer as a motion that the four papers mentioned be included in our evening session, and that the paper of Mr. Lockwood be deferred until our meeting to-morrow morning.

The President: If there is no objection we will proceed with the reading of the papers. Mr. Selden is ready to read his paper.

RAILROAD TELEGRAMS.

Years ago I became impressed with, what seemed to me, the shiftless manner in which railroad telegrams were handled and their appearance as contrasted with those of the commercial, or toll character. While the latter were filed or delivered upon printed forms, the railroad telegram was filed or delivered on any kind or shape of paper, or any old thing that came handy. It rarely bore any notation as to time of receipt or distinguishing marks that would enable one to tell the difference between it and a hurried note on any makeshift article upon which it could be written. This fostered in those engaged in its handling a contempt for neatness, a lack of

method and a carelessness of execution of the work. One of the first acts upon my part when opportunity came was to arrange a suitable blank and fortify it with proper spaces for numbering, timing and initialling, so as to trace for delays and locate errors, but more especially to encourage the operators to strive to make a nice appearing missive, and thus inculcate neatness and order. It is a great pleasure to now be able to say that it is the exception and not the rule to find a railroad telegram that is not upon a proper blank and having upon it the distinguishing mark of time and initials. The copies delivered are in the main very creditable and hence the service is raised to a higher plane and efficiency; but I felt that we should go still further in the direction of improvement and accordingly upon the Baltimore and Ohio we took another step. We took the position that a communication of sufficient moment to warrant its being placed upon the wires was of more importance than the ordinary run of commercial messages, and this being so, that such matter should be handled and surrounded with as many safe-guards as the commercial telegram, so we "checked" our messages and to distinguish them made the checks read "RS," meaning "Railway service." Plain rules of counting, admitting of no chance for discussion between operators, were adopted, and the rule provided that under no circumstances would a receiving operator be excused for a short or wrong check. The message received by him was in his hands entirely, so far as check discrepancies were concerned, and he had it in his power then and there to detect such errors; therefore, if a telegram which quoted a rate of "twenty-one" dollars a car was passed by him reading "twenty" dollars a car, even though the transmitting operator had sent it "twenty" that the error was chargeable to the receiving operator for allowing a wrong check to pass through and away from his hands. We count each figure or cipher as one word, and each fraction as one word, whether that fraction be ½ or ½₅₆, the fact of its being "a fraction" expressed in figures constitutes it one word. If the numerals be expressed in words, then, of course, they are counted as written words would be. The name of a town or state is counted one word. The initials of a railway as many words as initials are used—for instance B. & O.—3 words; C. R. I. & P.—five words, etc. Experience has taught us that our action in this has been productive of great good to the service and has more than repaid us for the little time consumed in connection with it. In ten years' use, we are better satisfied than ever and would not return to the old system any more than we would wish to return to the days of soft, white, brown or any scrap paper for telegram blanks. It is astonishing, but a fact, that in six years we have had but one case of error in rates quoted, due to a short check, while prior to our first adoption of this method they were comparatively frequent; very often they were made between two first class operators of good record, and it was impossible to place the fault on either one,

but now the short check accepted fastens the error upon the one accepting it, hence the care he exercises serves to keep the sending operator from getting into trouble, as well as himself, and most important of all, the railroad company from loss or controversy with the shipper. This system has led to still perchance more important results. Impressed with the large corps of operators in relaying and general offices, and the pay-roll which is necessitated thereby, the new and progressive B. & O. general officers allowed me to put in operation a plan that when fully carried out gives the Telegraph Department the right of charging for its work. Not with the view of simply giving it a bookkeeping credit, but to impress upon each official the fact that telegraphing is not "free," although so-called, and that it costs money just as does transportation, maintenance of way or equipment. As an experiment, and for easy accounting two rates were allowed, mainly 10 cents for ten words or less, 20 cents for anything over ten words. Instead of frequently receiving a circular calling his attention to the misuse of the wires, an official now receives a bill showing what the charges are against his department, and upon request the original messages are sent him. The result of a trial for two months has been very gratifying and will be better in the future. Not only has the volume of business fallen greatly, but wires are now so cleared that much better service is had. The interests of the road are not in the least affected, except to better them, and our pay-roll and wire rental shows a reduction of about five thousand dollars per annum and will soon show more.

It might be assumed that the amount of telegraphing upon the B. & O. system was proportionately greater than that of others, but from personal observation and information gleaned from officers I am satisfied that upon the large systems the same or even greater use of wires is had, and upon these systems the same good results and savings in salaries may be had by pursuing a similar plan.

This brings to my mind the question, "Why shouldn't the Telegraph Department of a railroad be allowed a charge?" A Division Superintendent will ask or instruct you to take an engine and crew; or five of them if you wish, but for heaven's sake hurry his wires up so he can move his traffic. You can have all the track men and train men you need and then at the end of the month you get a bill for every one of them. The maintenance of Way Department and the Motive Power Department will ask for wire connections or telephone service and the Telegraph Department receives a bill. Why? as a fair thing and to show what the Telegraph Department is performing for the money it expends. Shouldn't it be allowed a charge?

I think it is proper, but beyond that I know it impresses the officials with the fact that so-called "free" telegraphing costs absolute dollars, and the less done the fewer dollars expended, while at the same time it rids the wires of matter which only belongs to the mail and gives therefore to your legitimate telegraph missives a

clearer right of way, a quicker service, and to the department a reduced pay-roll. The work of accounting is simple in the method we are employing, and calls for but two blanks, copies of which I furnish herewith, and make a part of this paper, together with the circular orders making the plan effective. CHARLES SELDEN.

BALTIMORE AND OHIO RAILROAD.

Office of the General Manager.

Baltimore, Md., January 12th 1897.

General Order No. 19.

Effective February 1st, 1897. The Telegraph Department will make a uniform charge against other departments which file messages for transmission, at the rate of ten cents per message of ten words or less, and twenty cents where messages contain more than ten words.

Employes filing messages for transmission will insert in the "Charge" space provided on the message blanks, the name of the department in which they are employed, so that the proper charge may be made.

The charge for the transmission of a message shall be made against the department by which the sender is employed, whether the message originates with that department or is an answer to a telegram received from some other department.

Messages filed by employes of the Transportation Department will be charged against the division upon which the office is located where they are filed, except at junction or terminal points of two divisions, in which case they will be charged against the division upon which the sender is employed.

The Telegraph Department will render monthly bill for messages transmitted, and the department receiving such bill shall accept the charge without question. Upon request, the Telegraph Department will furnish original messages for which charge is made, and if it is found that any messages have been charged in error, credit will be allowed in bill for the following month.

The intent and purpose of this order is to reduce to a minimum correspondence by wire, and it will remain with the head of each department to take up with his subordinates the misuse of the wires where, in his judgment, it has occurred.

Approved:
JOHN K. COWEN,
OSCAR G. MURRAY,
Receivers.

WM. M. GREENE,
General Manager.

BALTIMORE AND OHIO RAILROAD.

Office of Superintendent of Telegraph.

Baltimore, Md., January 12th, 1897.

Circular Order No. 31.

TO ALL OPERATORS:

In accordance with General Order No. 19, a copy of which is herewith transmitted, you will be guided as follows:

The writer of a railroad telegram should insert, in the proper space provided on the blanks, the department against which the message should be charged, which should invariably be the one in which he is employed. Where they fail to do this, if you are certain of the department, you may insert it, but if you are not certain of it, after sending the message, you will refer it to the Chief Dispatcher upon the division which you are employed, who will return it to you with charge inserted.

Memorandum slips, form 459, will be furnished you and at the close of the month you will distribute the messages and arrange them in the proper order, according to the departments in which the senders are employed; placing, for example, all Transportation Department messages together and all Machinery Department messages together, etc., with memorandum slips to show the number of messages for each department, and the amount of the charge; this slip to be filed with the messages of each department. A bundle must be made of them by first taking the messages of one department and on top of these placing the memorandum slip; on top of this selection place the messages of another department, with accompanying memorandum, and so on; make a bundle of the whole lot and carefully file in your office, so that if called for they can be promptly forwarded to confirm charge as shown on form 458. This form must be transmitted to this office not later than the 15th of the succeeding month. Be sure that your files and form 458 agree before sending it in.

Operators will be careful to note that each message bears the name of the station at which it is filed, and if there is more than one office at that point, they will, in addition, prefix the office call.

Train orders only are exempt from charge.

Approved:
WM. M. GREENE,
General Manager.

C. SELDEN,
Supt. Telegraph.

Mr. Selden: I present to you, probably for the first time in railroad history, an account of how to curb useless telegraphing and a chance for you to save money, and that is what always appeals to a General Manager. If you will add to the fact that carrying out such a system enables you not only to reduce your

pay-roll, which is the first thing to do, but the more that it frees your wires, then such a system is well worth trying. I am more than glad that the Baltimore & Ohio Railroad, as a safeguard, for ten years has checked its railroad messages. We think that a message that is put on the wires of a railroad is necessary. If it is not so, then it is not fit to be put on the wires. We have gone further than that; we now make from the Telegraph Department a charge against other departments not merely to give credit upon the books but to reduce the useless telegrams that have heretofore been put on the wires which necessitated the building of more wires and sometimes the leasing of them.

I do not think any too much can be said from a telegraphic standpoint for Messrs. Oscar Murray and Wm. Greene, respectively our Receiver and General Manager, on the accomplishment of this step. It is a compliment to the telegraphers on railways not only, but to the craft and the business. One would suppose, probably all of you think, that it is a serious thing to handle—give you a great deal of trouble in the office—but really it does not. This whole thing is handled on two blanks, and I hold them in my hand. The one provides that each month, or each day if you choose, at the office they should file away a blank like this: (Blank shown.)

And at the end of the month there is your sheet with its messages and amounts.

(Applause.)

Mr. Swift: I would like to know how much force it takes in your office to keep up your business.

Mr. Selden: Just the same as I had before; I have not increased my office force. I want to impress that on the members. The operator at each station, for convenience of the parties, places these messages between blanks, and then he makes his report upon the blank as I have shown you. That comes to my office from 483 offices. They come in on the 14th of the month. The charges against every department are made and delivered to the Superintendent. We have made them out on short time.

with exactly the same clerical force and without working extra hours. I mean to say this, that if you will take the 483 such accounts coming in and have a clerk there, in about 24 to 48 hours he will have finished. When you send a bill to the Transportation Department for $10,000 for telegrams in the month of February, they have to accept it. If they object to the bill we say, "We will just give you the messages you sent and you can prove the account."

This whole thing as I said before, is not with a view of getting credit for your department, it is to save money. We have saved already over $5,000 a year, and I wager that if the same plan is put in use on any railroad of any extent on the same basis of percentage of pay-roll, you will save just as much as we have. I want to say this; I am anxious to help this matter still further along. I have just provided, the night before I left, with the approval of the General Manager, a quick delivery mail service in the telegraphic department.

Mr. Darlton: I would like to know if I understand you correctly that it takes the time of only one man fifteen days to compile this information, so if our people wish to adopt same we could judge of the probable cost.

Mr. Selden: It would take one man in my office twenty-four hours to do all the work. We make our report about the 9th to the 14th.

Mr. Foley: I would like to ask if it is considered economical to employ a high priced clerk to fold up a letter, copy it, and put it in an envelope, and whether it doesn't cost the railroad company more by sending it by train-mail than by telegram, actual expense, not against the telegraph department, but against the railroad.

Mr. Selden: I cannot say unless I know what you pay your operators, but the clerks of the officials seal their own envelopes and address them just as they do ordinary train mail.

Mr. Foley: We generally pay clerks as much as operators.

Mr. Selden: We pay operators more.

Mr. Sholes: In individual offices they report directly to you?

Mr. Selden: Yes, sir. If there is any objection to the charge the office stands ready to produce the messages. If there happens to be an error in the charge it can be corrected in the next month's bill, but in order to avoid correspondence the General Manager insists that they should accept the charge to that extent. I want to say another thing. I did not mean to answer quite so shortly to Mr. Foley as I did, but I answered truthfully. I say, no, we have not increased our clerical force one man on the road. We have reduced our expenses $5.000, and I think that answers the question in a better way than I did before, but we do pay our operators more than we do our clerks.

Mr. Foley: It occurred to me that perhaps it would cost more money in sending the messages by train mail than by telegraph. The road would not be making any money by the change.

Mr. Selden: I suppose on some roads it would not pay, but you should take into consideration ours is a large system.

Mr. Kinsman: I would like to know how long it has been in use.

Mr. Selden: Since February first.

A Member: Perhaps sometimes the man might have something important he would neglect to send by telegraph. I know one case of a railroad, I will not mention the name of the road, where an old Traffic Manager was called in and was told he was doing too much telegraphing, and that he must ask for rates by mail. They were not doing any business after that.

Mr. Selden: You may go to extremes. We are not trying to do that, besides a man who will not send an important telegram because it will cost ten cents has not sense enough to stay in his position.

Mr. Lockwood: I do not wish to prolong this at all, but hardly feel as though I should be doing the Association justice, if I did not express my own sentiments, not because I think I could do the subject justice, but that the subject is a very remarkable one for a paper. I was particularly struck with the question

the paper asked—"Why should not a telegraphic department charge for the work it does?" I am an old railroad man and know that every department I ever belonged to expected to make the railroad company a charge for everything it did. Back along towards 1860 I had saved my first $1,000, I think, and I was persuaded to make an investment in Mexican Central R. R., amounting perhaps to 10 shares. I paid $1,000 down and received 1,000 7 per cent. gold bonds, a certain amount of income bonds and my ten shares of stock. Right along the earnings of the company were reported from month to month as great, but the income for bond interest was small; and as the $1,000 was a small fortune to me then, I felt like inquiring where the earnings went, and found that much of it was a credit for carrying material to build the road with. No one questioned it, and as far as my experience goes, it is the rule to make a charge for work done by one department for another.

A question has been raised as to whether the supposed increase of clerk hire will be so expensive that the game will not be worth the candle. Whoever heard of a Freight Department making such an objection as that, or in fact, anything except the Telegraph Department. In reality it is done, and supposing it does cost something to do it, what is that compared to doing right. Charging is bound to reduce the work tnat is put upon the lines, so that whatever little additional expense may come, in the matter of clerk hire, etc., it will in the majority of cases be gladly accepted in view of the relief given to the wires, and in getting rid of the many useless and unimportant telegrams which are sent, which then will give place to the really important ones. For myself, I beg to express my great respect and admiration for Mr. Selden's paper and my cordial acquiescence in the appropriateness of the procedure it advocates.

Mr. Taylor: It seems to me that the effect of the system which Mr. Selden describes would be just as he states, but do we not get off the track when we argue with regards to the charges between departments. It seems to me that it would be a little odd if the Motive Power Department should say we will

charge the Maintenance of Way Department for every move of the engine on a work train. That is what the Motive Department is there for, to furnish motive power for trains. Of course if they do unusual work for the department they make a charge. The Maintenance of Way Department might say, "We will charge the Motive Department the wear on our property, rails, ties, etc. I merely speak of that because it seems to me that it is a fallacy, although I admit that the effect of that order if carried out would be decidedly advantageous.

Mr. Selden: Mr. Taylor you have a sub-charge on your road of "Maintenance of Way," "Motive Power," and a "Telegraph," all of which finally are charged against "Conducting Transportation." That answers your question, I think. The money on a railroad is made by conducting transportation, is not that so? They have, for instance, one hundred men. It should be shown at the end of the month what those hundred men have done and their charge. I woud say that in fairness I think the Telegraph Department is as much entitled to a charge as the Machinery Department is. If you order out the wrecking crew to put up your telegraph lines do they not charge for it?

Mr. Taylor: Our arrangements are a little different. They would charge it to "Expense Account of Telegraph."

Mr. Selden: Therefore I think your department should charge for work performed as do the others.

Mr. Rhoads: I understand this plan has been in force for only four months and that reduced the pay roll at the rate of $5,000 without giving any one the chance to talk much about it. Are we to understand that the mere fact of putting it in effect has reduced the amount of telegraphy to such an extent? That is not in accordance with my experience.

The President: Mr. Swift, we are ready for your paper.

THE TELEGRAPH.

BY A. R. SWIFT.

The life of the Telegraph Company is not always a happy one. It is not always permitted to pursue its way with uninterrupted smoothness; its lot is not always placid and serene. Like every other

business, profession or employment it has its troubles, worries and vexations of greater or less degree.

One is very apt to think that his own particular employment has more troubles than that of his neighbor, when the neighbor in turn, thinks his own is the worst of all. The man in business for himself, at times, wishes he were with some large corporation, thinking there he would escape the annoyances constantly occurring; while the man in the service of a corporation many times longs to escape the worries arising from time to time by being in business for himself, and thus be freer and more independent.

Any invention or discovery becomes great or valuable in proportion to its merit in filling some want or necessity of the pubic. In the life of all such inventions and discoveries of the greatest good to mankind, there are two stages or epochs of existence. In the first place they are considered, in their earlier days, as great boons and benefactions; objects of wonder and praise, and second, as people grow accustomed to them, they are degraded in their estimation to mere common place necessities, and even objects of the most fanciful and captious criticism. The generation that never knew what it was to be without a thing that it constantly uses, does not know and cannot appreciate its worth, and never for a moment stops to consider its value, nor what they could do without it. Take for instance a little thing like a lead pencil, carried around and used a thousand times a day. Who ever stops to think of its usefulness or what would be done without it were it unknown. Like all earthly blessings it is used, and enjoyed without thought that it is a blessing, but as a mere matter of course.

When the sleeping car was first introduced and used, the weary traveler retired to his berth with a feeling of thankfulness for the privilege of the night's good rest, and with thoughts of thanks and gratitude for the inventor. Such feelings are rare today. We hear more expressions of criticisms than of commendation. The traveling man stripped to pajamas is damning the porter because the car is cold; while the fat old lady across the aisle, apprehensive that she might appear to disadvantage in case of accident, has rolled into bed, shoes, sealskin and all, and is loudly scolding because the car is kept so beastly hot, and I read of a man who considered it his privilege to kick merely because he was expected to tip the poor porter, who has to live somehow or other. Like the sleeping car, the telegraph has outgrown that period in which it was regarded in the light of a benefactor. The people no longer view its operation with wondrous surprise, and the exclamation, "See what God hath wrought," has degenerated into expressions in some instances condemning the system to the lower regions. The fact of being able instantly to communicate with persons thousands of miles away is not considered worthy of a passing remark, and these gentlemen whose lives are devoted to the

upraising of the people, observe that familiarity breeds contempt, are frequently and profanely termed "lightning jerkers."

For the means of conveying intelligence and information by the thousands of messages flashing through oceans, and from continent to continent, there is no word of praise, but for the single one that has been ever so little delayed, or in which there is the slightest error, there is at once a loud outcry of poor service, and if it is a possible thing to impute to that delay or error anything of loss or of mere inconvenience, small though they may be, there is a rush to the courts, and if there has been no actual injury financially or otherwise, resort is had to that legal nondescript, that unmeasurable and sentimental term, "mental sufferings," and substantial damages are recovered on that basis, and for that reason alone. A man is often awarded by a jury of his peers, a larger amount for the mental suffering of a few moments, than he could earn by any operation of that same injured mind in as many years. It is our fortune, or misfortune rather, that our business is regulated, and sought to be regulated in various ways, and by many powers that be, other than ourselves. Congress seeks to, and does regulate us. The legislatures of all of the States and all of the Territories regulate us; the Railroad Commissioners in many States are endowed with power to regulate us, and freely exercise that power.The City Council in every City try to regulate us, and when these are not sufficient the Courts of all grades, in all the land, come to the rescue, and they, too, regulate us. We certainly should be well regulated. We all have observed men who in some unexplainable way have become members of legislatures, and whose unexpected elevation to that exalted office causes them to dream they are the star born sons of destiny, and statesmen, men whose management of their private affairs have been lamentable failures, and who would not be entrusted with the duty of regulating an eight day clock; but who now assume the duty of regulating the entire business of the telegraph companies, of whose operation they know absolutely nothing at all, and to do it, as they believe, better than those men who have devoted their lives to thoughtful study of the subject, and to whose labors and intelligence the world is indebted for all the improvements and perfections of its most wonderful and useful invention, improvements and perfections little known and less understood by the ordinary layman. Many laws of this nature are born of spite from some fancied slight, many from ambition to appear to the constituency of the member introducing the same, as a public benefactor in striking at a "greedy, soulless corporation." While many laws providing for the taxation of telegraph companies have originated from a desire to compel the corporations to bear the burden of the support of the State, and to remove that burden from the farmers' land. What more potent argument for election than the promise to secure the passage of bills that will reduce the taxes of the voter, and with this in view the telegraph companies are

compelled to pay taxes on their real and personal property, on their capital stock, and again on their earnings, through the thousand of taxation districts through which the lines are operated. One State legislature passes a statute on a system of taxation of telegraph companies that secures a largely increased revenue. Another State legislature taking that statute as a precedent, studies it and in every way endeavors to enlarge it that it will pan out a larger sum, and if other ways seem plausible, and likely to be sustained by the Courts, other systems of taxations are invented and made into laws, until the telegraph companies may well despairingly utter "they are after us." Then when Congress and the various legislatures are through with us, though they never do get through, the City Councils take us in hand, and the regulators keep on regulating, and just as we settle down under the ordinances of one Council its membership is changed by election and the new members have new ideas of what should be done and new ordinances are drafted, introduced and passed. and a new era of legislation is commenced, and so it goes merrily on.

Then the Courts are the resorts of the disaffected. Here is the haven of the man with a grievance. If he has not been injured in any way entitling him to compensation for damages actually received, he brings his suit in the name of the "People" or of the "Commonwealth" for the recovery of statutory penalties and recovers damages where there has been no injury. The growth of the number of damage suits against telegraph companies, in recent years, has been utterly out of proportion to the increase of business or of earnings, and has become a serious object of apprehension. Suits of every kind imaginable are instituted, and many are allowed to pass into judgments, which do not seem reasonable, nor based upon equity, justice, or business principles. I noticed a case where a judgment for a statutory damages was obtained against a telegraph company on account of the delay in the transmission of a telegram sent by a young man to his mother, announcing the important fact that he would bring a friend home to dinner with him. I suppose the damages were sentimental and consisted of the mortification of the young man in not having as elaborate desert as he otherwise would have had, rather than on account of the damage to his friend in not finding enough to eat on the table. However, the case was thrown out by the higher Court, because it was fortunately discovered that the message was sent on Sunday, and the company was not required to deliver it on that day. Had it been on a week day no doubt the community would have been benefited by largely increased attempts at hospitality. I saw another case where a man brought suit for damages for delay in sending a telegram directing the family carriage to meet him at the station. The element of damage caused by the failure of the family carriage to be there consisted of "mental suffering and apprehension." I am glad to know that he failed, even in

Texas. The Court probably held that if he couldn't have the family carriage it was his duty to ride home in any old carriage that was at hand.

Another case arose in Texas where a party brought a flock of 1,300 sheep in Cook county which he wished to drive to his ranch in Throckmorton county, so he telegraphed to his man on the ranch as follows: "Meet me immediately with two horses at Buffalo Springs. Bring Shep." Shep was the name of a dog. When the message arrived it read: "Bring Sheep." Without inquiry or any more ado, the man gathered together all the sheep on the ranch, 2,500 in number and drove them across the country to Buffalo Springs, where he failed to meet his master, and after waiting there two days without sufficient food or shelter for the sheep he drove them all back again to the ranch. The telegraph company was made to pay for the damage to the ranch flock arising from the journey and for damages to the other flock on account of its being delayed for want of the assistance of the servant and of "Shep."

Another Texas case held that on account of the failure to deliver a message summoning a physician to attend the plaintiff's wife during confinement, a recovery of damages could be had for the injured feelings of the wife, but it drew the line on the injured feelings of the plaintiff himself. The old man was probably doing as well as could be expected under the circumstances.

Another case, not in Texas, however, was where a father sent a telegram to prevent the marriage of his daughter, a minor, but it did not arrive in time to prevent the ceremony. He sued the telegraph company, and recovered for the loss of the girl's services until she became of age, and also damages caused by mental suffering arising from the fact that the match was an unsuitable one to him.

Where a message was delayed unavoidably on account of storm the Court held the telegraph company liable in damages, for the reason that the sender of the message was not notified that it would be delayed by the storm. Hence there is necessity that operators should be well instructed in weather observations and predictions. Another Court awarded a party damages for delay in a message whereby he was prevented from being with his wife during child birth, for the reason that his presence would have been of advantage to the wife both mentally and physically. It was not shown that there were any ill results suffered, or bad effects on either mother or child. The substantial reward of $600.00 was sufficient to pay all the expenses of the affair and leave a handsome surplus for the next.

A party was expecting a telegram from Staten Island on a business matter. In transmission, Staten Island was made to read South Carolina. He was not expecting a message from South Carolina; but he did not stop to consider the whys nor wherefores, but

left on a fruitless journey to South Carolina. He was given damages, the Court holding that he was not negligent in failing to make any inquiry in the matter.

It was the earlier rule that a recovery of damages could not be had for mental suffering alone. That was then considered too sentimental, remote and speculative, and the rule required a showing of physical or financial damage in order to justify a judgment. This rule has, however, been gradually nullified and departed from, until now the Courts are said to be practically unanimous in permitting damages for no other cause than that of mental suffering alone. Think of the wide field of speculative litigation that is thus thrown open, of the opportunity of bringing all kinds of fanciful, sentimental and spiteful cases, as well as cases purely fraudulent. It was also once the requirement that there should be some notice given to the telegraph company of the peculiar importance of the message, before it was sent, before the company could be held liable for damages for any failure or error, but the Courts have so modified this rule, that almost any circumstance will be construed as notice to the company. Not only that the company must take notice of the importance of the message from the language used in it, but that it will be held to have that notice where there is any possible fact or circumstance from which that knowledge could possibly be inferred. As, for instance, a telegraph company has been charged with notice of the relationship existing between the parties named in the message whether disclosed by its terms or not.

A message was delayed which read: "My wife is very ill, not expected to live." The sender, though suffering no pecuniary loss, was found to be entitled to compensation for mental anguish, as the message was notice to the company that mental anguish would probably come to some one if not promptly delivered.

A boy ran away from home; his father telegraphed to the boy's uncle inquiring if the boy was there. There was a delay in the delivery of the message, and the father recovered damages for his mental anguish, and it was held that it made no difference that the boy was alive and well at his uncle's house, as his father's fear was that he was killed, stolen, or lost. Thus the more timid person, the one with the most vivid imagination would be entitled to the most damages. A man is given damages, not because of the existence of a fact, but because he fears or imagines the fact might exist. As well might a man recover damages from a sleeping car company for mental anguish suffered while in a night mare, under the allegation that the dream was caused by the car being too warm, or why not sue the restaurant keeper for the frightful fantasies of a dream caused by the Welsh rarebit, or lobster, a la Newberg, taken in before retiring.

The efforts of the telegraph companies to ensure correctness are often times unavailing. The condition that the company will

not be responsible unless the message is repeated has been held to be of no moment whatever, and the companies have been held liable for errors in unrepeated messages, and the printed notice upon the back of the telegraph blanks have been held to be void in many instances, and the requirement that all claims or complaints must be made in sixty days has been held to be unreasonable and void.

These facts do exist; as Mr. Cleveland puts it, "It is a condition, not a theory that confronts us." With the known consequences, all we can accomplish is the removal of the causes. And the causes of the troubles lie in a large degree at the hands of the operator in transmitting the message, or of the one charged with the delivery. "It is human to err," and there is said to be no earthly perfection; but the attempt to render the system as perfect as can be, involves the instruction and discipline of a vast army or operators, messengers and other employes, embracing persons of every grade of intelligence, and of many degrees of education and experience.

The greatest trouble is in the small offices in the small towns throughout the country. Aside from the slowness and undue deliberation in such places arising from the surrounding methods of attending to business, the fact is often found that too much is expected of the operator. He is the agent of the railroad company, and telegraph operator as well. His duties are diverse and he is generally noted as the busiest man in town. He must attend to the general business of the telegraph company, and at the same time the general business of the station for the railroad company. He must attend to the movement of trains, sell tickets, answer all inquiries, and find time to give information, both telegraphic and railroad, to all coming to the depot; he must check trunks, check out and bill express and receipt for same, attend to the collection of freight and see that it is loaded and unloaded, and a thousand of detail matters that not only require time, but at the same time call for wise judgment. It is no legal defense for the delay of a private message that the contract with the railroad company required that certain hours be given exclusively to the use of the wires and operator in the management of the trains; but the private message must be given precedence according to the time of its receipt.

We have seen cases where the duties of a station required the services of two men, yet in a time of depression when receipts were running low, and economy was the watchword, the railroad company has reduced the force to one man, and he was required to do the work of two, and the same degree of effectiveness expected of him.

To obtain any degree of perfection in the face of these circumcumstances, is readily seen to be a difficult undertaking. All that can be expected is to make the service as perfect as can be, and this can be accomplished only with the operators themselves. Men by nature are of diversified temperaments and habits. It is one's nature

to be affable and courteous, another's curt and impolitic. And herein lies one of the greatest evils in the system. Many of the cases in the Court's would never be heard of if at the time of the occurrence of the affair complained of, were the parties pacified by courteous treatment, and polite explanations, or with due apologies. Men are not unreasonable as a general rule, and the secret grievance is, in a large majority of cases, the treatment received when the complaint is first made and when the mind is disturbed and irritated on account of supposed or real grievances. Of course, it is impossible to expect every operator, among so many thousands, is, or can be an "Admiral Crichton, or a Chesterfield," or is possessed of the patience of Job, but it should be understood that the operator is not representing his private affair, or his own personal feelings, but the business of a company that expects him to attend strictly to that business without any loss of temper, even when the temper is most tried. With this rule firmly impressed and kept conveniently in view by every operator, a large decrease of litigation, and in the number of complaints would be the happy result. You have heard, no doubt, the expression used at places where there is such an operator, by some one who thinks he has a grievance, "I'd make it hot for the company, but don't want to do anything that would hurt Jim." It would not be so if Jim had expressed himself as might be expected from human nature.

The ideal operator, therefore, should possess these requirements: (1) Activity and strict attention to business, (2) Courtesy and politeness under all circumstances, and (3) Common sense. Were these essentials combined in all our employes, there would be a service I confess, idealistic, that would be free from trouble, complaints and litigation. We may not have it here, but we all meet in convention in the New Jerusalem, then we at last will know the workings of a perfect and harmonious system.

The President: : The next paper is by Mr. Kinsman.

THE APPRENTICESHIP SYSTEM.

By G. C. Kinsman.

The selection of employees for minor positions may be regarded as one of the most important questions with which the Superintendent has to deal. If, in filling all unimportant places, he secures young persons of character and capacity for increased responsibility, —if these employees are then so treated as to induce loyalty and a knowledge of the fact that their interests and the interests of the Company are identical, the standard of efficiency will be raised, and the conditions for revenue correspondingly improved.

Those who have given this subject serious thought and trial will appreciate the fact that the ideal is not of easy accomplishment.

Students in offices, messenger boys and apprentices must serve for a time for little or no money compensation for the reason that they can earn for the Company no more than it must give in the time of its skilled labor for their proper advancement.

If this instruction is omitted or indifferently given, as will be found true in many cases, the beginners are apt to lose interest in their work and to seek associations more congenial, but less honorable, and the Railroad Company will stand before their parents and before the community as exerting an undesirable influence.

Under these circumstances we attract and are likely to employ those we wish to avoid, and make it difficult to secure the best material.

If the selection of students and messengers is left to agents and operators, it will be found impossible to eliminate the influence of relationship, religious and political prejudice, and personal favor. These reasons alone seem to make it almost imperative that the selection of employes for minor positions should, so far as possible, be placed in the hands of persons not directly interested.

My idea would be a board of not less than five officials, selected with the greatest care from different Departments, this board to hold stated meetings for the purpose of acting on applications, its secretary making investigations in accordance with its formulated rules, the heads of the Departments to refer to the board for investigation and approval, the applications of persons thought desirable for future employment, and to have authority to employ such persons in cases of emergency, subject to the action of the board.

The question of the advisability of taking students in regular telegraph offices is one that will bear much discussion. It has some advantages, and is surrounded with many elements of danger.

We take a boy into an office to learn telegraphy, and invariably forbid his touching the wires or instruments, a command which is necessary if we wish to avoid wire trouble, but which is sooner or later broken. My own opinion (and I have been for the past twelve years, until recently, connected with a school conducted for the sole purpose of preparing operators for our service) is that it is far better to give the beginner a technical education in a suitable school before taking him into the office, thus laying the foundation for greater efficiency than can otherwise be acquired.

The Wabash Railroad Company is at present taking a limited number of students into its offices. Applicants are first required to furnish evidences of character. They are also asked for their school certificates and church record. If these appear satisfactory, the Division Operator may call them to his office. If the impression made is favorable, they are then sent to the Company's surgeon for physical examination. If physically sound and free from color blindness, they may fill out the regular application blank, and sign the student's

agreement, which is written thereon, this student's agreement to be subsequently approved by the parents. The manager of the office must also agree to enforce its provisions. If student's are under age a minor's release is also required from their parents or guardians.

The approved applications are recorded and filed by the Superintendent of Telegraph, and the subsequent record of the students endorsed thereon.

[Blank application (Form 453) shown.]

The President: The next paper is one prepared by Mr. Korty. As he is not present I will ask the Secretary to read it.

DELIVERY OF COMMERCIAL TELEGRAMS AT RAILWAY STATIONS.

By L. H. Korty.

One of the most important duties at a railroad station where commercial telegrams are handled, is the prompt and proper delivery of such messages and yet most of you no doubt have often been vexed by cases of failure and neglect of this duty coming to your attention.

Delays in the transmission of telegrams at railroad offices are far less frequent than in their delivery. There are many operators who seem to consider the prompt transmission the only essential requirement, and who will contend for circuit to a degree beyond the limit of the rules in order to rush a message and get rid of it, but who will delay the delivery of a received message with the utmost indifference, and often, to make matters worse, when finally delivered, no receipt is taken or time of delivery noted. This latter neglect is also quite common at some stations, as is also the failure to note, in proper places, the different degrees of service from time of filing up to that of delivery. Some operators, although carefully marking the time a message is sent, fail to show the time it was filed, thus leaving uncertain the time of delay at the originating office in case complaint is made.

Some agents who would not think of delivering a shipment consisting of scrap iron, an old horse collar or any old thing without taking an iron clad receipt, will deliver commercial telegrams involving thousands of dollars without any kind of a record of the transaction, and when asked to produce receipt for a lost message will tell you that they did not know it was necessary to take receipts for commercial messages. The chief "griever" of the Order of Railroad Telegraphers on the Union Pacific System gave this excuse recently when asked to show delivery of a certain Western Union telegram, and this man has had many years experience as an operator and agent, and, from the fact of his occupying an important position in

the Order, is regarded by his fellow employes as a man well up in the duties of his profession.

Some patrons of the telegraph are so apprehensive about the delivery of their messages that they prefer to send them "collect," under the impression that if charges are to be paid at destination the operator is more apt to give the delivery better attention than he otherwise would.

The telegraph company's rules on this and other subjects are clear enough, but the average agent and operator does not familiarize himself with them. He often gets his training at a station where the commercial telegraph business is a secondary matter and where the rules governing this business are not followed. Such a man is the bane of the Railway Telegraph Superintendent in charge of the commercial telegraphing of his road.

Many telegrams are received at stations addresed to passengers on trains. These must necessarily be given to the train conductor to find the party. The conductor may be unable to give it personal attention and turns it over to the brakesman to find the owner, but "Brakesy," in his anxiety to resume his seat with the lady passenger whom he is entertaining, does not make a thorough search through the train, puts the message in his pocket and the matter is forgotten until the usual claim for damages on account of non-delivery is received. Investigation proves but one thing, namely, that the message was received at the station, but nothing further is on record. The operator claims he turned it over to the conductor of the train, but has nothing to show for it as he failed to take his receipt. The conductor disclaims all knowledge of it. Asked why he does not take receipts for commercial messages delivered, the agent in this case may reply that he does take receipts from everybody except conductors who usually decline to receipt, and be responsible, for telegrams for parties on trains. Under these conditions there is no certainty that a message will ever reach the owner, or, in case of failure to find him, that the sending office will be notified of non-delivery.

Most of the irregularities in delivery service exist at the smaller offices where there is no messenger and not sufficient business to justify the employment of one; the agent performing all the various duties of the station, including delivery of telegrams; and as station employes too often look upon the commercial telegraph business as an outside matter, imposing upon them duties for which they receive no compensation, this branch of the service is most likely to suffer and be subject entirely to their personal convenience; yet the telegrams received at these thousands of small railroad offices constitute a considerable portion of the whole telegraph business of the country and therefore justly demands our careful attention and individual efforts to improve. Although a railroad company may not share

directly in the telegraph earnings, it is compensated in one way or another through its arrangements with telegraph company, and, aside from the contract obligations to properly handle the telegraph business at stations, there is a moral obligation on the part of the railroad company toward communities and patrons who are dependent upon its employes for this important service.

An agent charged up with the tolls on a message delayed or lost through his negligence, generally profits by the experience and is thereafter usually more watchful of this business; but we should not wait for our employes to be educated in their duties by this means. The paltry amount of tolls refunded to the claimant does not entirely appease his feelings and he will always entertain a lack of confidence in our telegraph service as well as the service in general at railroad stations.

How best to accomplish an improvement in this service is a question. I have through special instructions at various times reminded all concerned in my jurisdiction of the necessity of prompt and proper deliveries in accordance with the rules, but any improvement resulting therefrom has been only temporary on account of so many changes, and new comers to break in, and I find that although some start in to take receipts for deliveries they are apt after a time to conclude that it is an unnecessary duty and abandon it. I have recently commenced another plan which I believe will prove more successful if kept up, and that is to frequently call for delivery sheets from all offices for a certain month to be sent in with monthly reports for the purpose of examining the same and to check them up with the number of messages reported delivered on Western Union form 41. By this plan the offices that fail to keep up their delivery sheets can be discovered, which alone will be of considerable value to the Superintendent, even if he does not take the time to check them up to see if any entries are omitted. I don't know but what it would be a good plan to have all delivery sheets sent in with each monthly report and filed in the Superintendent's office.

In order to get the train conductors into line in regard to delivery of messages for parties on trains, we invoked the aid of the General Manager, who issued a circular on the subject as follows:

"1. Conductors will receipt to operators for all commercial telegrams handed them for delivery on trains.

2. Due effort must be made to find parties addressed and receipts taken for such telegrams on form supplied for that purpose, first writing thereon party's address and time of delivery.

3. If party cannot be found, notice must be wired to receiving office from the next stop.

4. If any charges are to be collected on telegrams, the same must be paid over to the receiving office as soon as possible. In case a party decline to pay charges, telegram may be delivered, but notice of such refusal must be wired to receiving office.

5. Blank form of receipts are to be pasted on inside of Conductors' Report Book, form 2638 and 2639. These receipts must be preserved as evidence of proper delivery in case complaint is made. Future supplies of Conductors Report Books will have blank receipts for telegrams printed therein."

This circular was issued two and a half years ago and since that time there has not been a failure of a commercial message reaching a passenger on the Union Pacific System.

(Copies of Conductors Report Books containing form of receipts and the General Manager's circular, shown.)

Adjourned until 9:30 the next morning.

SECOND DAY—MORNING SESSION.

Meeting called to order on Thursday, June 17th, at 9:30 A. M.

President: We have a number of communications that have not been read which it would be well to bring up.

Telegrams and letters read.

Here is a letter from Mr. Edison.

Orange, N. J., June 14th, 1897.

J. W. LATTIG, Vice-Pres. Nat. Assn. Ry. Telegraphers:

Dear Sir—Owing to some important matters which require my presence at the mill, it will be impossible for me to attend the convention, for which I am very sorry. Yours truly,

THOS. A. EDISON.

Secretary: I have to offer the following names for Honorary membership under our rules by which members who withdraw from the Telegraph Department and have paid up their dues are eligible to Honorary membership:

A. Hayward, B. & O. S. W., Cincinnati, O.

F. W. Wilson, San Barnadoes, Cal.

W. D. Vincent, Pittsburg, Pa.

C. M. Halstead, Ft. Dodge, Ia.

Mr. Darlton: I would like to present the names of M. F. S. Gannon and Mr. J. H. Barron, respectively Vice-President of the Southern Railway, Washington, and Chief of Transportation, and would like very much to have them made Honorary members of this Association.

Mr. Selden: I would like to present the names of Mr. J. W. Fortune and Wm. M. Greene as Honorary members of this Association.

Secretary: We can only admit as Honorary members those who have been in the telegraph service. Mr. Greene is a telegraph operator?

Mr. Selden: He is.

Mr. Lang: In addition, I would like to submit the names of W. J. Murphy and Albert Briggs as Honorary members, the former is Superintendent at Lexington, Ky., the latter at Somerset, Ky.

Secretary: I would like to offer the name of Summer J. Collins, General Superintendent of the Wisconsin Central as an Honorary member of this Association.

Mr. Smith: I would like to offer the name of W. D. Ewing, General Superintendent of the P. R. R., and a very strong friend of our Association.

Mr. Fry: I would like to offer the names of the Vice-President, A. J. Earling and General Manager W. G. Collins, of the C. M. & St. P. R. R., Chicago.

Mr. Evans: I would like to offer the names of C. D. Gorham of the N. Y. C. & St. L., Fort Wayne, Ind., and W. L. Blair, Conneaut, Ohio.

A Member: Mr. President, I move that these gentlemen be elected Honorary members.

Second the motion.

The President: It is moved and seconded that the gentlemen mentioned be elected Honorary members of this Association.

All in favor, Aye; contrary, Nay.

Carried.

Secretary: We also have a number of letters here from Nashville, Tenn.; from the Mayor, Governor of the State, Director General of the Tennessee Centennial and International Exposition now being held at Nashville, Tennessee, in which they send us a very cordial invitation to visit the Exposition in a

body or individually. They guarantee us that they would give us every possible attention and a hearty welcome. I do not suppose we can go in a body but I would like some acknowledgment for the courtesy of the invitation.

Mr. Kinsman: I move that the Secretary be authorized to make suitable acknowledgment of the invitation sent us.

Mr. Foley: I second the motion.

The President: It is moved and seconded that the Secretary be authorized to make suitable acknowledgement for the invitations offered us. Are you ready for the question?

It is so ordered.

Secretary: Mr. President, I would like to say to those who have come in that we are ready at all times to receive dues.

President: Members who wish to pay at the present time can do so.

Mr. Foley: I would like to ask the Secretary how many members there are in this Association at the present time.

Secretary: There are, with the five who have joined at this meeting, seventy active members and pretty near that number of Honorary members; about seventy Honorary and seventy active members, and right here in this convention, (I am glad Mr. Foley brought it up) you see that we are barely holding our own in membership. We lost three by death and four who took an honorary position on account of their withdrawing, so we are barely holding our own in membership, and we can barely keep up our expenses at $5.00 apiece. There is only one other way we have of receiving income and that is by the sale of extra copies of minutes. Last year we only sold $4.50 of extra copies, and I have over one hundred copies at Milwaukee uncalled for. Now you know we can get that extra hundred copies of minutes printed very cheaply so that if we can sell one hundred extra copies a year it helps us out quite a little in our expenses, and it would seem as though enough demand would be made for extra copies by the members to enable us to dispose of 100 or 150 copies at a price that would bring us in a little income, and we would be able to keep about even. If you will

note, last year you owed the Secretary $83.50 at the close of the year, all other expenses having been paid. This year you owe the Secretary $90.00 at the close of the year, all other expenses having been paid, so you can see we can just barely hold our own. It is very flattering the requests we have for our minutes from foreign bodies. Our minutes are now sent to the State Universities of five or six of the largest states in the Union. They are sent to technological institutions at various points, they are sent to Railroad and Warehouse Commissions. We also send quite a number of copies abroad. We send to Norway, to Railway Commissioner of that country a copy; we send to parties in London mechanical institutions; we also send to several mechanical institutions in this country. So you see our minutes are becoming known and are being asked for by parties that we are very much interested in ourselves. It seems to me that we ought to be able to get enough revenue to get up a good full report of our proceedings. If other people are enough interested in them to ask for them, it certainly seems that we ought to be enough interested in them to be able to raise enough money to print them in good shape. I simply throw this out at this time, hoping you will endeavor to keep up our membership. We ought to have not less than 100 and if a few of you would try to use your influence among your personal friends, I am satisfied we would keep up our membership and that our expenses could be met easily. I have been a little backward from the simple fact that our largest single item of expense is the payment of our Secretary, but I believe we have to sink a few personal reasons and give you those facts as I have stated.

President: It is to be hoped that the members will subscribe as many copies of the proceedings as possible, that all the members this year will try to do their very best to bring in new members.

Mr. Fry: I subscribe for two dozen.

Mr. Selden: When our Association was formed we figured that the dues should be such as would pay up the expenses of the institutions. We have gone beyond that and I think our dues

are too small. Of course that brings up the question whether each one pays the money himself or whether his road pays the money. If it is not enough advantage to him to pay that much money for himself, why then of course he ought to drop out. I think our dues are too small; I think they ought to be $10.00 instead of $5.00. I do not believe that you are going to get many members because the whole tendency of the time is to consolidate; by and by four or five roads that are represented here will be one road. It may not be next year. There was a time when I had the pleasure of our road being represented in this Association by five and since then we have reorganized and consolidated, and here we are represented by myself. I think, too, that our Honorary membership is too large; we are getting to that point where the number of our honorary members equals, I think perhaps exceeds those of our active members. The active members in this Association are the people who pay the dues. I am going to offer a resolution that a committee be appointed by the Chair to report at the next meeting upon what they deem to be a proper initiation fee and yearly dues to carry out the purposes of this Association.

Motion seconded.

President: It is moved and seconded that the Chair appoint a committee of three to consider this question of dues and report at the next meeting. Are you ready for the question?

It is so ordered.

President: In the absence of the Special Committees the next business in order is the election of officers. I hardly think we ought to proceed to that until more of the members are here.

Secretary: There is one Committee that we usually appoint about this time in the meeting, which I think it would be well to appoint and let them be getting their acknowledgments ready, that is, the Committee on Acknowledgment of Courtesies received. Usually a committee of three or four is appointed. The point is we would like to have that committee report so that it can be published in the papers by the time we leave. It then is connected with the Association as proceeding from the Associa-

tion to the local public, and it is better than having it reported so very late we do not get it in the papers; the people do not receive the acknowledgment they ought to have.

I move that it is necessary that a Committee on Courtesies be appointed at this time.

Seconded.

President: It is moved and seconded that a committee of three on acknowledgment of courtesies be appointed.

Carried.

President: I appoint Mr. Magiff, Mr. C. S. Rhoads and Mr. S. K. Pullard. The Committee can obtain from the Secretary the necessary information. He has a record of all parties who have extended courtesies to this Association at this meeting.

I dislike very much to proceed with the election of officers until we have some more members here, still that is the next business in order.

Secretary: Mr. Chairman, as a paper that the Committee reported on is published and has been pretty generally distributed, how would it do for us to have that Committee start in and read that paper; of course it is proper that they should read the paper but it was in print and has been very widely circulated and there are some additional copies here and it seems to me we ought to use this spare time and that Committee go ahead and read the report and by the time the next paper is reached the gentlemen who are a little slow in getting in would be present and we would have no discussion until both papers are ready and then we will have a full attendance.

Mr. Lockwood: The suggestion of Mr. Drew is very pertinent. We were informed yesterday that the Sleeping Car people would be here to attend to the wants of those who wished to arrange for free sleeping car privileges on their return trip, and as it is about 9:45 now, if there is anything which can be done which is shorter than the reading of a paper, why not do it?

President: I think that paper could be read in fifteen minutes very nicely. If there is no objection we will proceed with the reading of that paper and then take up the regular order of

business. Will Mr. Fry please read the report of this Committee?

Mr. Fry: Mr. President, in preparing this report one of my associates furnished the greater portion of the information, and in view of the fact that he has it arranged in convenient form, I would request that you allow him, Mr. Ryder, to read it.

Mr. Ryder reads the report.

REPORT OF COMMITTEE ON LOW RESISTANCE RELAY EXPERIMENTS.

Your Committee has continued during the past year the experiments referred to by Superintendent Fry, and described by him at our last meeting.

While a great many telegraphers have been unable to free themselves from the old theories and traditions that have surrounded them for years, and have been inclined to look with skepticism upon any suggestion that there might be something better than the old standard 150 ohm relay, still the results obtained through these experiments have been so conclusive as to leave little chance for doubt.

The work of the Committee has been confined to two lines of experiments, viz.: the splitting of the coils of standard relays, and the use of low resistance, series wound, pony relays.

The scheme of splitting the relay coils has been tried upon fifty-one circuits under the varying conditions of five railroads. The result in every instance has been a decided improvement in service, this being especially noticeable in bad weather, although the relays have undoubtedly worked better in good weather through their quicker action.

The old theory that the best results are to be obtained when the combined resistance of the relays in a circuit equals that of the wire and batteries, has been repeatedly quoted as absolute proof of the impossibility of improvement through the use of relays having a lower resistance than the standard.

The following figures taken from actual measurements, before and after making the change of connections, show that, if any improvement was effected, either the theory itself is wrong, or there has been some error in its application to telegraph practices.

		Before.	After.
No. 1.	Line Resist...	3836	3836
	Inst. Resist...	3366	712
	Total.....	7202	4548
	74 miles, 19 offices.		

		Before.	After.
No. 2.	Line Resist...	3575	3575
	Inst. Resist...	2700	675
	Total.....	6275	4250
	100 miles, 18 offices.		

		Before.	After.
No. 3.	Line Resist...	2391	2391
	Inst. Resist...	3990	750
	Total.....	6381	3141

80 miles, 20 offices.

		Before.	After.
No. 4.	Line Resist...	4661	4661
	Inst. Resist...	5912	975
	Total.....	10573	5636

114 miles, 36 offices.

		Before.	After.
No. 5.	Line Resist...	4109	4109
	Inst. Resist...	5703	1050
	Total.....	9812	5159

146 miles, 28 offices.

		Before.	After.
No. 6.	Line Resist...	3451	3451
	Inst. Resist...	5627	900
	Total.....	9078	4351

160 miles, 36 offices.

No. 1 is a train wire, the relays on which were changed recently, the change being made during a damp, foggy day when it was absolutely impossible to work the wire through. Linemen were hurried over the line with a lot of multiple relays, which were distributed from a passenger train, the change being made while the train remained at the station. An improvement was noticed after the first few relays had been changed, and when all the multiple relays were in the circuit, with the weather practically unchanged, the wire worked as well as it had before in the best of weather. The dispatchers have since reported the wire as working better in good weather than it ever did before, the relays seeming to have lost their sluggishness.

No. 3 is a train wire only eighty miles long, the business on which had to be relayed in bad weather. A careful insulation test showed the wire to be in fairly good condition; equal to the average. Since the relays were changed, the wire works perfectly through all kinds of weather. No other change was made.

No. 5 is a way railroad wire that worked so badly in wet weather it had been decided to put a set of repeaters in the middle of the circuit. Before this was done, however, the multiple scheme was tried with the result that the old trouble entirely disappeared and the wire is now working satisfactorily at all times.

There is nothing particular to be said about Nos. 2 and 4, except that they were practically useless in bad weather, but since the relays were changed both work well all the time.

No. 6 will be taken up in detail further on.

One peculiarity of the multiple relay is its susceptibility to damage by lightning. This would be a serious thing were it not for the peculiar effect the lightning has on the magnet wire itself, and the fact that almost invariably the line is kept closed through the relay even though the instrument is burned out and useless. It is an unquestionable fact that the multiple relays burn out quicker from lightning than those series wound. In the latter case the magnet wire is cut here and there throughout its entire length, frequently necessitating rewinding with new wire, the old being in so many pieces as

not to be worth jointing and rewinding. In the case of the multiple instruments, however, of all those repaired in a certain shop, not one has been found burned beyond the fourth convolution from the binding post, and in the layer next the core; in other words, the lightning apparently came in at one binding post, took the wire leading to the inside of the coil, burned off the insulation from three or four turns next the binding post, crossing the wires with core, went around the heel piece to other core, burned insulation off three or four turns next to the binding post on that side and passed out on the line again. The result is that when the relay comes in for repairs, all that is necessary is to rewind the old wire, throwing away two or three inches of the inside layer on each side next the binding post. This, of course, means a considerable saving in the cost of repairs to burned out instruments.

Another peculiarity that has been noticed is the sensitiveness of the multiple relay to the residual magnetism in the cores. Relays have been sent in with a report that they could not be satisfactorily worked on the line. A careful investigation showed nothing wrong with the connections and when tried with current passing through the coils in opposite direction from the first trial, the relay worked apparently perfectly. Soon complaint was again made that the relay was working imperfectly, and a second reversal of the current once more improved the service, but it was found the improvement only lasted a short time. As each reversal of current resulted in a temporary improvement, it would indicate the polarity of the residual magnetism had been reversed, either by the normal telegraph current or possibly by an extra heavy current, due to leakage or other causes. This simply shows one of the effects of the application of the "Hughes" principle, if it may be so termed, to relay construction.

It has not been found practicable to reduce the batteries as was at first thought possible, and in most cases they remain the same as before the change was made. This results, of course, in the use of more current and hence more material and labor is necessary to keep up the batteries, but what does this amount to as compared with the increased efficiency of circuits.

While there is no doubt in the minds of your Committee but that a great improvement can be made on circuits having any considerable number of instruments by the use of the multiple scheme, their success with the twenty-five ohm pony, series wound relays has been so great that the former scheme seems extremely crude.

You will recollect your attention was called to these relays at our last meeting, and in fact one was exhibited, but the idea of their use was so radical a departure from standard practice that very little attention was given to it.

A number were purchased and placed here and there on different circuits with gratifying results. Then it was decided to equip all the

offices on a certain especially hard working train wire. This circuit, (see No. 6, in tabulated statement), was 160 miles long, measuring 21 ohms to the mile, and had 36 offices, the total measurement being 9,078 ohms. There were 300 cells of battery giving a normal current of about 30 mili-amperes. During bad weather it was absolutely impossible to work the wire through, which necessitated its being cut in the middle and a portion abandoned. The multiple scheme was first tried with the result that for months there was no occasion to cut the wire because of bad weather. The 25 ohm relays were substituted about four months ago and the battery cut down to give 33 mili-amperes, since which time the wire has worked equally well in good or bad weather.

The relays require practically no adjustment and signals come from the distant offices on the same adjustment as is necessary to get an office only a few miles away. Recently one road purchased sixty of these relays to be used here and there on different circuits where most needed. Some of the circuits have multiple relays and some series wound, but the new relays are working perfectly wherever placed, and the men using them are asking for more. The statement can truthfully be made that there has as yet been no place found where the pony relay did not work much more satisfactorily than the one it replaced. Another thing that should be taken into consideration when comparing the pony relay with the multiple scheme, is the fact that the battery can actually be reduced in ratio with a reduction of circuit resistance, which of course, lessens the cost of battery maintenance.

It certainly seems desirable to reduce the relay resistance to the lowest possible point commensurate with good service, and the working of the pony relay leaves little to be desired. Some experiments with a twenty ohm relay of the same pattern as the twenty-five ohm instrument, indicated that the one of higher resistance was much superior. Your Committee, however, is not prepared to say that the 25 ohm relay is the best that can possibly be made for general use, but the results obtained certainly prove it to be much more efficient than the standard instruments.

The question may be asked, are not the good results we obtain in bad weather through the use of the low resistance relays due to the fact that the wire resistance decreases to a very great extent in wet weather, and thus the relative resistance conditions more nearly approach the theoretical? Granting for sake or argument, this is true, how are we to account for the great improvement noticed in good weather?

Some of the benefits derived from the use of the ponv relays are undoubtedly due to their improved mechanical construction, the weight of the armature being reduced to a minimum. However, we believe still more is secured by the lessened retardation and self-in-

duction of the core and coils. This is a matter which has been considered of very little importance in the past, but which apparently affects the working of the telegraph circuit to a considerable extent.

It is the opinion of your Committee that the trouble with the old theory lies in its application to telegraph circuits. This theory aims to secure the maximum magnetic effect in an electric-magnet and does not take into consideration the effect of leakage, retardation, or self-induction of the relays. As a matter of fact, it makes no difference whether the relay armature is pounding against the front stop or whether it only touches it lightly, so long as the contact is firm enough to close the local circuit. With the multiple or pony relays the ampere turns may not equal that of the standard wound relay, but are sufficient to satisfactorily work the armature, and the lessened magnetic lag and self-induction through the shortening of the coils of the multiple relay and both the shortening of the coils and core of the pony relay, more than make up for the loss of ampere-turns.

With the multiple scheme it is not practicable to decrease the number of cells of batteries if we are to maintain anywhere near the same number of ampere-turns as in the ordinary relay, but the lessened resistance in the circuit in this way provides a much better path for the current and the tendency to leakage is greatly reduced. On the other hand, the use of the pony relays not only secures this result, but as we get the benefit of all the current passing around both coils instead of dividing as in the multiple scheme, we can cut down the potential to a considerable extent and thus reduce the leakage still further.

The success of these experiments has been so great your Committee feels warranted in bringing them in detail before this Association in the hope that others may be induced to try the scheme.

U. J. FRY,
G. H. THAYER,
W. W. RYDER.

President: Before we open the discussion on that paper we will have Mr. Lockwood's paper read. In the meantime I would like to inquire of Mr. Sholes if he succeeded in preparing his report.

WHEREAS, An all-wise Providence has seen fit to remove from our midst our beloved co-workers, M. B. Leonard, R. B. Gemmell and J. G. Pinkerton, be it resolved that in their taking off, this Association and the craft generally have suffered a great loss. Their many virtues and high standing attainments endeared them to us and enabled them to leave in each case a record more than worthy of emulation.

Resolved, That a page in the minutes of this Association properly draped be set aside for these resolutions and that a copy suitably engrossed shall be presented to the immediate families of the deceased.

C. SELDEN.
C. G. SHOLES.
C. F. ANNETT.
H. C. SPRAGUE.

Mr. Ryder: I move that the report of the Committee be accepted and the Secretary carry out the suggestion.

Seconded.

President: It has been moved and seconded that the report of the Committee be adopted. Are you ready for the question?

It is so ordered.

President: The next order of business is the election of officers.

Mr. Darlton: We would like to have Mr. Lockwood's paper read, if it is in order, before we proceed with the election of officers.

President: It is going to provoke a great deal of discussion.

The election of officers is the next order of business. Nominations for President first.

Mr. Magiff: I nominate Mr. J. W. Lattig as President for the ensuing year.

Mr. Kinsman: I second the motion.

Secretary: Are there any other nominations for President? Our by-laws provide that the vote shall be by ballot.

Mr. Darlton: I move that the Secretary cast the vote of the Association for the President.

Seconded.

Secretary: You have heard the motion. Are you ready for the question?

It is so ordered.

Secretary: The ballot is cast for Mr. J. W. Lattig as President and he is declared elected.

President: The election of the Vice-President is next in order.

Mr. Foley: I would like to nominate for Vice-President Mr. W. W. Ryder.

Motion seconded.

President: Mr. W. W. Ryder has been nominated for Vice-President.

Mr. Darlton: I move that the Secretary cast a ballot for the election of the Vice-President.

Seconded.

President: It has been moved and seconded that the Secretary be instructed to cast the ballot for Mr. Ryder as Vice-President for the Association. Are you ready for the question?

It is so ordered.

President: The ballot is cast for W. W. Ryder as Vice-President and he is declared elected.

President: The election of the Secretary is next in order.

Mr. Darlton: I move that the President be instructed to cast a ballot for Mr. Drew as Secretary and Treasurer.

Seconded.

President: The ballot has been cast and Mr. Drew is declared elected the Secretary and Treasurer for this Association for the ensuing year.

President: I have not heard from those transportation people and until they show up, I think we might proceed with our business. The next order of business is the reading of Mr. Lockwood's paper.

Mr. Lang: Would it not be well while the business is progressing for a committee to be at work for the selection of place for our next annual meeting. They would then be ready to report.

Mr. Ryder: Mr. W. C. Brown, General Manager of the C. B. & Q. R. R. and one of our Honorary members, wishes me to attend to this Association on behalf of the Burlington Route an invitation to hold the next annual meeting at Hot Springs, So. Dakota. Only recently has this place come into prominence as a resort, but the Black Hills, in the midst of which it is situated, are through history, familiar to us all. The varied scenery,

the many natural curiosities, the delightful temperature, and the fine hotel accommodations make this a charming spot. Judging from the amount of enjoyment many of our members derived from ocean bathing at Old Point last year, I believe the great plunge bath, 250x75 feet, with a natural temperature of 96 degrees, will prove a popular resort for our party. Another natural curiosity within a few miles of the Hotel is the great Wind Cave with its hundred or more miles of explored passages.

Secretary: Mr. President, the representatives of the Sleeping Car Companies are present. I move that a recess of ten minutes for renewal of passes be taken.

Seconded.

It is so ordered.

RECESS OF TEN MINUTES.

Secretary: I have a letter here that I would like to read before any further action is taken. This is from Omaha.

Omaha, Neb., June 14, 1897.

P. W. DREW, Sec'y Ass'n of Railway Telegraph Superintendents, Niagara Falls, N. Y.:

DEAR SIR—Permit me to call your attention to the fact that the Trans-Mississippi and International Exposition, an enterprise greater than any of other similar character ever held in this country, with the single exception of the World's Fair, takes place at Omaha in June-November of next year. By reason of this fact and the accessibility of our city, together with our facilities for properly accommodating large numbers of visitors, Omaha will be the natural convention city for 1898. To this end, we are formally requesting the holding of all national meetings of that year at this point. Several national associations have already decided to meet here next summer, and we trust we may have the pleasure of welcoming the members of your organization also.

I beg to enclose a pamphlet setting forth the general scope and extent of the Exposition, and to assure you that if it would not be too much trouble for you to place copies within reach of the members of your organization at the coming meeting in Niagara Falls, we would be pleased to forward as many as could be conviently disposed of by you.

Hoping that you will be able to favor us in this direction, and

that we will have an opportunity of reciprocating when you visit the exposition next year, I am, Very truly yours,

G. M. HITCHCOCK,
Manager Dep't. of Promotion.

We also have a letter from the Manager of the Hygeia Hotel at Old Point Comfort asking if we want to go back and hold our next convention there. They would be very glad to see us.

Mr. Ryder: In connection with the first letter the Secretary has just read I would like to state Omaha is on our main line midway between Chicago and Hot Springs. and if members desire arrangements can be made to visit the Trans-Mississippi and International Exposition enroute to or from Hot Springs.

Mr. Magiff: I move that Mr. Ryder's suggestion be adopted and that we hold our next meeting at Hot Springs, So. Dakota, on the third Wednesday in June next, 1898.

Mr. Selden: I second the motion.

President: It has been moved and seconded that we hold our next meeting at Hot Springs, So. Dakota, on the third Wednesday of June, 1898. Are you ready for the question?

It is so ordered.

President: Mr. Lockwood's paper is the next in order.

THE RELAY AND ITS RELATION TO THE TELEGRAPHIC CIRCUIT.

By Thos. D. Lockwood.

In 1896 I was most unfortunate in that I was not able to be present at the annual meeting of the association, whose honorary membership I consider to be one of the most estimable and valuable rewards which in my professional career I have had the privilege of receiving.

As is usually the case, the several papers presented there were all valuable, useful, and intensely practical. But the telegraphic periodicals which came before me, spoke of a particular one in such terms as to inspire me with a good deal of interest and curiosity, which in due season I was, by the arrival of the published proceedings, enabled to gratify. This particular paper was that offered by Mr. U. J. Fry, on "Reduction of Relay Resistance;" and as soon as I had the opportunity, I read it over several times.

The subject was well chosen, is an ever living one, and I think

was very happily and ably handled. While I do not, of course, take it upon myself to compare the paper in question with the others presented at the same time, or to discuss its relative merits, I do feel called upon to say, that it was one which strongly appealed to me; and I was gratified to note, that judging from the preamble to the resolution advocating a continuance of the experiments by a special committee, it was highly appreciated by the members present.

I was in fact so rejoiced at seeing the subject under consideration, that I took the liberty of corresponding with Mr. Fry about it. And after the exchange of a few letters; and after he had kindly sent me copies of the Telegraph Age, discussing the question, apropos of his paper, I intimated to him, that unless he considered by so doing I should be trespassing on his territory, I was disposed to follow his paper up, by preparing one myself for this meeting; if I were requested to prepare any at all.

I am bound to say that he kindly and frankly encouraged me to proceed, and as a consequence this paper is now inflicted upon the Association.

The telegraph relay is of course an electro-magnetically operated key, controlling a short local circuit containing the electro-magnetic helices of a sounder; and having its own electro-magnetic coils adapted to be placed in the circuit of the main line. The armature portion of the main line or relay electro-magnet has a lever which is poised in trunnions or pivots in close proximity to the poles of the horse-shoe or fixed portion of the iron core, and these on the passage of a current through the coils tend to pull the armature closer to them, against the power of a counter spring, which as soon as the current ceases, pulls it back. The armature lever is in the local circuit, and at its free end carries a little platinum point, which when the lever is attracted, strikes a front stop of platinum which forms the other end of the local circuit; and thus closes that circuit, enabling the current of the local battery to flow through it, and through the magnetizing coils of the sounder, which then becomes operative, and gives the audible signal required.

But the armature lever has also a back limit stop, which is insulated or non-conducting, and when the main line circuit is opened, or when from any cause the current through the relay coils ceases to flow, or flows too weakly, the counter spring becomes stronger than the magnetic attraction, and the armature is consequently pulled back by it, the end of its lever separating from the conducting front stop, and receding until it strikes the non-conducting back limit stop; thereby opening the local circuit.

Let us disregard for the moment that function of the instrument which gives it the name of "relay," and let us consider it merely as an electro-magnet; remembering that such term either expresses or implies an armature also.

The electro-magnet was originally invented in 1824 by Sturgeon, who wound a U-shaped iron core, varnished to give it an insulating surface, with one layer of bare wire. He had, of course, to keep his turns pretty far apart, so that they would not make contact with each other, and thus cut out more or less of the winding; and we are apt to think the device a rather crude affair.

We must not, however, forget that it was the first of its race; and from that point of view, it was a wonderful improvement and it worked.

An account of the Sturgeon electro-magnet appears to have almost immediately set our own Professor Henry to experimentation; and within the year he had made certain radical improvements in the electro-magnet, bringing it practically to the pitch of efficiency at which it now stands; although the why and wherefore did not, until within the last twenty years, find expression.

I scarcely think I can do better for you, than to use the actual words of Henry himself. He says:

"The next improvement was made by myself. After reading an account of the galvanometer of Schweigger, the idea occurred to me that a much nearer approximation to the requirements of the theory of Ampere could be attained by insulating the conducting wire itself, instead of the rod to be magnetized; and by covering the whole surface of the iron with a series of coils in close contact. This was effected by insulating a long wire with silk thread, and winding this round the rod of iron in close coils from one end to the other. The same principle was extended by employing a still longer insulated wire, and by winding several strata of this over the first, care being taken to insure the insulation between each stratum by a covering of silk ribbon. By this arrangement, the rod was surrounded by a compound helix formed of a long wire of many coils, instead of a sing'e helix of a few coils. In the arrangement of Arago and Sturgeon, the several turns of wire were not precisely at right angles to the axis of the rod. as they should be, to produce the effect required by the theory, but slightly oblique; and therefore each tended to develop a separate magnetism not coincident with the axis of the bar. But in winding the wire over itself, the obliquity of the several turns compensated each other, and the resultant action was at right angles to the bar.

The arrangement then introduced by myself was superior, first in the greater multiplicity of turns of wire, and second in the better application of these turns to the development of magnetism. The power of the instrument with the same amount of galvanic force was by this arrangement several times increased.

The maximum effect. however, with this arrangement, and a single battery was not yet obtained. After a certain length of wire had been coiled upon the iron, the power diminished with a further

increase of the number of turns. This was due to the increased resistance which the longer wire offered to the conduction of electricity. Two methods of improvement, therefore, suggested themselves. The first consisted, not in increasing the length of the coil, but in using a number of separate coils on the same piece of iron. By this arrangement the resistance to the conduction of the electricity was diminished, and a greater quantity made to circulate around the iron from the same battery. The second method of producing a similar result consisted in increasing the number of elements of the battery; or in other words, the projectile force of the electricity which enabled it to pass through an increased number of turns of wire, and thus by increasing the length of the wire, to develop the maximum power of the iron.

To test these principles, an experimental magnet was constructed. * * *. From a series of experiments with this and other magnets, it was proved that, in order to produce the greatest amount of magnetism from a battery of a single cup, a number of helices is required; but when a compound battery is used, then one long wire must be employed, making many turns around the iron; the length of wire, and consequently the number of turns being commensurate with the projectile power of the battery."

We may thus see that Henry's work in increasing the power of the electro-magnet consisted first, in insulating the wire instead of the core; second, in winding many layers; third, in showing that in a given circuit with given battery or current, we may increase the attractive power of the magnet by adding turns to the winding, up to a certain point; fourth, in proving that after reaching such certain point, the addition of more turns weakens the current by increasing the resistance of the circuit, more than it increases the magnetization of the core, by carrying the current so weakened round it; and finally in demonstrating that when such point is reached, the increase in attractive power may be continued by connecting up two or more equal portions of the long fine wire winding in parallel, instead of one after the other.

This summary of Henry's work shows that we have not advanced from the point to which he brought us, to any material extent.

Let us now see what we can do in the way of applying these principles to main telegraph lines, relays and local circuits.

The use of the relay and local circuit came straight from Morse, and is the subject of his second patent. Although subsequently on some telegraph lines, it became possible to employ and get fair results from, what we know as "Main Line Sounders," or "Registers." we are all well aware that the use of the relay, local circuit, and sounder are wonderfully convenient on a long line; and it is as well recognized to-day, as it was thirty years ago, that to work with locals and sounders is, generally speaking, by far to be preferred.

As the length of a circuit is increased, the strength of the current is correspondingly enfeebled; it is evident, therefore, that there is a limit beyond which, even if a large battery be used, signals will be too weak to act satisfactorily upon the receiving apparatus.

But the diminution of force due to resistance is as nothing compared with that arising from those defects of insulation which it is practically impossible to remedy, especially during wet or foggy weather. It is thus quite necessary in working such circuits, to provide a receiving instrument capable of responding to a feebler current than that required for the sounder, which shall be able to close the local circuit of the sounder. This is the duty of the relay.

But while the mode of operation, mentioned above, is as I have stated to be preferred, let us not be satisfied without asking ourselves, why?

Why should we not, and why do we not place our sounder in the main line and work it, and save the relay and local battery? If this question were propounded to a score of operators, and intelligent operators, we may easily imagine a diversity of replies. One will say, "Because it won't work;" another, "Too low resistance;" another, "Wound with too coarse wire;" etc.; but every one will agree with the unreasoning reason of No. 1. "It won't work." However, let us propound the question the other end to, and see whether we get more satisfactory replies. Why do we prefer to place a relay in the main line and employ it to control the sounder circuit? Again, we hear different supposed reasons: A says, "Because that is the right way to do it;" B says, "Because the relay has high resistance;" C reports, "Because the relay is wound with fine wire;" yet again we shall agree with A, when he says that "is the right way to do it;" and there is, I am sure, not one of us who if he had two instruments at his disposal, a 150 ohm relay and a 6 ohm sounder, would not think he was doing better to connect the relay in the main line and reserve the sounder for his local circuit.

The real truth is, that we place the relay in the main circuit not because it has higher resistance, and not because it is wound with fine wire, but simply because the current on the line at its best is but weak, and because it is therefore needful to carry that weak current round the iron core a very great many times, in order that we may get the requisite magnetizing force. But, to do this we must have a large number of separate convolutions; and we cannot have these without a very considerable length of magnet wire; moreover, to get a sufficiently large number of turns round the core, close enough to it, to be of any use, we are compelled to use fine wire, so that having a wire which is both small and long, we necessarily have a winding of relatively high resistance; or, as we say, we have a high resistance relay.

We have now reached a point where we see that the essential

thing is to carry our magnetizing current round the core many times. In other words we want "Ampere turns."

It is hardly necessary for me to recall to you that the ampere is the unit of current strength and represents the current which we should get in a circuit having a total resistance of one ohm, with an electromotive force of one volt; or in a circuit having a resistance of 100 ohms with an electro motive force—say, a battery of 100 volts. We may get an idea of an ampere, by considering that a 16 candle power Edison lamp carries a current of about half an ampere; and that an arc lamp works with a current of from 8 to 12 amperes.

Now, we cannot have, and do not need any such current strength as that of an ampere on our telegraph lines. It would for many reasons be highly undesirable; and the current of a simplex telegraph line ranges from a minimum of about twenty to a maximum of forty milli-amperes. The electrical engineers of telegraph companies prefer to start out with about 40; being pretty sure that insulation will depreciate, and more relays will be added, without corresponding increase of battery; and that the current throughout the line will gradually creep down. So it comes about that in all probability the average current strength of telegraph lines is nearer thirty milli-amperes than forty. Let me say here that the term milli-ampere simply means a thousandth of an ampere, so that a current strength of 30 milli-amperes is 3/100 or about 1/33 of an ampere.

Experimental research has deduced the general law, that the magnetic force developed in a soft iron bar is proportional to the product of the strength of the current, and the number of the turns surrounding the iron core; and this in the profession is termed "ampere turns."

Here, then, let me repeat, that what we need in a relay to bring out its best attractive power is "ampere turns;" enough to bring out the necessary magnetic strength, but not enough to add dead resistance without adding to the power of the magnet. If we can do this without using fine wire, so much the better, but we cannot. If we can do this without involving high resistance,—nay, without any resistance,—so much the better; but we cannot. And it is by reason of the circumstance that fine wire and high resistance are inseparable and inherent accompaniments of the ampere turns of relays, that the practice has grown up of specifying relays by their resistance; although such practice is inexact.

Pope, in his last revision says:

"As the electrical resistance of a wire is directly as its length, and inversely as its sectional area or the square of its diameter, it will be obvious that the number of turns in the coil of any electro-magnet must have a direct and invariable relation to its resistance, and hence the resistance of a coil may be taken as a measure of the number of turns of wire it contains. This is convenient in practice, inasmuch

as the resistance easily determined by proper apparatus, while it is not so easy to find the number of turns in a coil after it has been wound. It is for this reason, and not because the resistance itself has anything to do with the matter, that it has become customary among telegraphists to classify electro-magnets by reference to their measured resistances."

Looking, therefore, to the production of magnetizing power alone, we cannot avoid the inference that to get the best work out of our relays, we must wind them up to a good many turns of fine wire, and that within certain limits we shall therefore find an advantage in high resistance relays. These "certain limits" of which I speak, are apparently reached in telegraph relays when the thickness of the winding, from the core to the outside layer, amounts to about half an inch; it is better to keep well within that limit, with a core ⅜ of an inch thick, and we may conveniently have a spool not much more than 1⅛ inch to 1¼ inches in diameter. Wire wound on the spool of a telegraph relay a greater distance from the core than ½ of an inch may be considered as adding resistance alone, without doing any good; and the rule for electro-magnets generally may be stated by saying: The best depth of coil for a given number of turns is that which approximately equals the diameter of the core.

The dimensions and proportions of relay magnets have been the subject of numerous experiments in order to determine the most favorable conditions, in respect not only to the quality of maximum attractive force with a given current, which so far I have chiefly considered, but also to quickness of action, which in telegraphic apparatus is an equally important consideration. These experiments corroborate the before recited considerations, and have led to the manufacture and introduction of the standard 150 ohm relay made, as will presently be described, as being an instrument of excellent average proportions, for the average circuit, carrying the average telegraphic current.

The electro-magnet of such a relay is composed of two soft iron cores, each 2 inches long and 1⅛₂ of an inch thick, joined together by a soft iron yoke or heel piece 2 inches long, and ¼ inch in thickness. The magnetizing coils taken together have a standard resistance of 150 ohms, and are composed of about 1820 feet of No. 32 insulated copper wire, 0.009 of an inch in diameter, wound up to a spool diameter of 1¼ inches. This length of wire gives about 8500 convolutions.

Such a length of such a size of wire fills up a spool of the stated dimensions, and the outermost layer is sufficiently near to the core to be useful.

Figuring on the attractive power of these 150 ohm relays, so constructed, we may reasonably assume the average current value of 30 milli-amperes. We multiply the 8500 turns of No. 32 wire by the

value in milli-amperes and find that we have 255,000 milli-ampere turns; or reducing, a magnetizing force of 255 ampere turns.

Suppose we have a circuit with a relay magnet of the above standard type connected therein, and that we are desirous of ascertaining whether the work of the relay may be improved by cutting down its resistance, how shall we go about it? Disregarding for the present the question of improvement in operation, we must decide which of the three ways at our disposal of reducing the resistance of a relay magnet is the best. Shall we simply wind the spools with a much smaller amount of the standard length of the standard size of wire? Shall we wind it with wire much larger, so that the lesser amount required to fill the spool will have a resistance reduced as required? Or shall we connect the two standard relay spools wound with the standard wire and length in parallel, and thus bring it down?

The first plan is so obviously bad, that we may discard it at once; since by it we should leave a large portion of the effective space round the core unutilized, and lose much magnetizing power. The second is a much better way, but even it is not as economical as the third, which counteracts in a great measure the back electromotive force due to the reaction of the cores as they gain and part with magnetism.

The question of operation improvement is now to be settled. We have seen that 8500 turns with a 30 milli-ampere current gives us a magnetizing power of 255 ampere turns; but being ordinary mortals, we are not content. "Man never is, but always to be blest." Accordingly we think that fewer turns of a larger wire may give us better results, because it reduces the resistance; or that perhaps it will for the same reason be a good thing to join up the spools of the relay in parallel.

Now, we may reason this way: If it be a fact that reducing the resistance of a relay magnet gives us better results, the more we reduce it, the better our results must certainly be. Why not?

Fortunately, it is not a difficult thing to try. We certainly cannot go lower than a single convolution round each core; so we choose an insulated copper wire so big as to fill the entire space on the spool intended for the coil, and pass it once round each core. It has of course practically no resistance. Unfortunately, if the current in the circuit be still but 30 milli-amperes, the magnetizing power with but one turn has a value of only 30 milli-ampere turns, which amounts to nothing; and as a matter of fact with such a winding to make our relay as effective as before, we should require a current in the circuit of no less than 255 amperes; which, having a capability of warming up a good size copper rod,—and for many other reasons as well, is clearly out of the question.

Evidently, if it be advantageous to reduce the relay resistance we must stop short of such extreme measures. Let us then try a

relay of 50 ohms resistance, still assuming the average working current of 30.

We can make a good 50 ohm relay by using the same cores as before, winding them, however, with 4000 turns of No. 27 wire. But when we multiply, we find that instead of the 255 ampere turns we have in the standard relay, we obtain with this one but 120 ampere turns. Certainly, so far as magnetizing power goes, we have made a change for the worse.

But to come to a case which has already been before us, viz.: the Milwaukee and Oskosh circuit mentioned last year by Mr. Fry; we note that the resistance of the relays of this line averaged 150 ohms each, that the total resistance of the circuit was 6810 ohms, and that the battery was one of 150 cells. If these were blue vitriol cells, there would be an electro-motive force of about 150 volts; and dividing these 150 volts by the 6810 ohms, the normal current of the undoctored line was 22 milli-amperes only.

The current here, to begin with, was lower than it ought to have been. We are informed that when all of the relays were altered by joining their spools in parallel, the battery was reduced to 75 cells, the resistance having been reduced to 3938 ohms,—but this step (still supposing blue vitriol cells) brought the current down to 19 milliamperes; so that the ampere turns acting on each relay, were reduced in two ways; first by having them between the two relay spools in parallel; and second, by cutting down the main line current.

For under the original conditions each relay would have a magnetizing power of 187 ampere turns, while after the alteration each could only have a magnetizing power of 40½ ampere turns since the disposable power of 81 ampere turns which otherwise could be attained from the reduced battery is halved by connecting the spools in multiple.

It must be distinctly understood that I do not at all doubt that the improvement reported by Mr. Fry took place; but I should expect that there were some conditions in the case of which we are not informed. Unquestionably, the paralleling of the coils acted advantageously in another way to which I must presently advert; and it is not improbable that in a circuit of so many stations, the particular evil of the inductive discharge was really the disturbing agency. The matter of the relation of other lines supplied by the same battery is also one to be considered.

I am with Mr. Fry as far as the change in his spools go; in that I can conceive of conditions where improvement would follow such change; but I think it would have been better to leave the battery unreduced; for, while it is true that by reducing the battery power we do, indeed, decrease insulator leakage, it is also true that we, in the same proportion decrease working current. Whatever the battery

power, the current is bound to divide between the line and insulators directly as their respective conductivities.

So far, however. we have devoted more consideration to the relay and current, than we have to a full fledged telegraphic circuit, with a large number of relays connected in it, at as many stations. But after all, it is only in its relation to the circuit, that the study of the relay becomes of great importance. Hence we cannot neglect the study of such relation.

For in such circuit, not only is the magnetizing power and quickness of action of each particular relay acting as a receiver to be considered, but we must likewise consider the relays as a whole, in their condition as a part of the circuit through which the current designed to actuate each particular one has to flow, and realize that each and every relay at each closure of the circuit develops in its coils, and consequently in the main circuit, an inductive impulse of current having a direction opposed to that of the main current; and at each opening of the circuit a similar impulse of current, in the same direction as that of the main current.

The effect of this is to make the relays slower than they ought to be in attracting their armatures; and slower than they ought to be in allowing the springs to retract them. It is this effect which is acting, when an operator, while sending, experiences a sensation as though his key was working with difficulty, and as though in consequence, he cannot make the signals as clear and fast as he knows he is able to, on an easy circuit.

All that has been said concerning the reduction of relay resistance per se, and the necessity of ampere turns, applies with even greater force to relays on a well loaded circuit than they do to a shorter circuit, or one which has but few relays.

The substance of the ideas indicated is as follows: In the electromagnets of relays the effect of a current is multiplied by the number of turns of wire in the coil. It is lessened by an increase in the distance between the wire and the core, each layer acting less powerfully than the one beneath it. The current itself is enfeebled by each addition to the length of the coil, because of its increased resistance, and this is more felt when the coil is placed on a short circuit than when the line conductor has itself considerable resistance, because in the first case, a slight addition to the resistance of the coil bears a large proportion to the total resistance of the circuit, while in the latter case, the proportion is but small. None of us, for example, would wind a sounder spool in a local circuit up to 150 ohms, for the very apparent reason that such a resistance would unduly weaken the current furnished by a small local battery as well as for another very important reason, that fine silk covered copper wire costs much more than coarse wire. These facts are made very clear by placing

the coils of a relay in a local sounder circuit without taking the sounder out.

What follows? Why, that the sounder magnet will not work, while the relay magnet will work with considerable force. There was once a popular repeater—that of Bunnel, I think—which worked on this principle, and the old-fashioned way of explaining it was to say: "When a current of low intensity passes through two magnets differing considerably in resistance, the attraction of the magnet having the least resistance is very small in comparison with that of the other."

But as we now know, the real state of affairs is much simpler, and is just this, that the high resistance of the relay winding reduces the strength of the local current so much that it can no longer excite sufficient magnetizing power in the few turns of the coarse winding of the sounder, while the many turns of the relay make the most of such current as is left, and are therefore still able of doing their work.

When a line wire is very long, the current will necessarily be feeble, and the coil should consist of a great length of fine wire, which occupies little space, and allows very many layers to be wound on without increasing the distance from the core too much, while its resistance bears too small a proportion to that of the rest of the circuit to reduce the strength of the current materially.

We thus learn, not only that to get magnetic strength we must have a good allowance of ampere turns, but also that in a line of many relays the resistance of all of them, to get the best results all round, should be the same. If one is 150 ohms, all should be 150 ohms. If a lesser resistance be adopted, still all should have the same. The reason for this is plain.

If 20 relays on a line are each 150 ohms, and a new station be opened and provided with a 300 ohm relay, and a winding to correspond, while it is true that the station having the 300 ohms will be likely to always have it work well, all the other stations on the line will suffer; because the total resistance of the circuit has been unduly increased, and the current correspondingly decreased. I learned this experimentally years ago, when buying from the late L. G. Tillotson a relay for a new telegraph office on a railway wire having already upwards of 25 relays in circuit. He asked me how many offices were so far connected, and on being told, said: "Then you want for your office a 350 ohm relay. That will give you a pull over them all." And it did.

In the discussion last year on Mr. Fry's paper, Mr. Ryder happened to say, "Tradition tells us that the combined resistance on a circuit should equal the resistance on the wire."

That is not quite the tradition, or as it has been called the "law." Culley, a well known English authority, says of this: "Theoretically, the maximum power of attraction is obtained when the resistance of

the coil equals that of the line and battery;" but he hastens to hedge by saying, "But this law is applicable only to a perfectly insulated circuit, and not to the greater number of cases in practical telegraphy."

Our old friend Haskins dug up the so-called law out of Noad's antiquated text book, and quotes it in his little work on the galvanometer as follows: "When the resistance of the coils of the electromagnet is equal to the resistance of the rest of the circuit i. e. the conducting wire and battery, the magnetic force is a maximum;" and then he quotes from an early edition of Pope's Modern Practice, to this effect: "The application of this law to a telegraphic circuit would be to make the sum of the resistances of all the magnet coils in circuit equal to the resistance of the line and batteries; but as in practice the resistance of a telegraphic circuit varies, being considerably reduced by defective insulation, the total resistance of the instruments should be less than that of the line when in good condition, to attain the best results during unfavorable weather."

Obviously, Mr. Pope's meaning is explained by reference to another saying of Haskins, to the effect that "the difference in resistance between the linewire and the insulators is the margin upon which the line is worked.

If that margin is diminished by bad insulation, a portion of the current escapes to the ground. If the resistance of the line wire is increased, the margin is again diminished, and a portion of the current escapes as before."

So while the above law as explained by Mr. Pope is clearly a good one, and ought to be followed, it simply means: Don't unduly increase the resistance of your line, by adding an extravagant number of stations, and a relay at each.

The resistance of your line wire is, generally speaking, fixed. You can't add to that, but you can, if you wish, add more relays. Don't do it; and it doesn't mean, add a great many relays to a line; a good many more than it ought to have, and then reduce the resistance of the circuit by crippling the relays.

For a telegraphic superintendent to connect relays without stint in a telegraphic circuit, and to then strive to reduce the resistance of the circuit by winding the said relays with but few turns of wire, and thereby greatly and disproportionately lessening their magnetizing power is to my mind just about as reasonable, or as unreasonable, as it would be for a man who, having raised an abnormally large family of sons and daughters, and finding the drain of a dozen full grown stomachs expensive, seeks to economize, not by reducing the number by marrying off his daughters, and starting his sons off to look out for themselves, or by engaging the lot in some useful work, which is the common sense remedy, but by putting the whole family on half rations, and thereby reducing their ampere turns, as well as their expense.

The evils consequent on the abnormal number of relays could have been prevented by limiting the number of offices on the circuit, and in the case of the man and his family, by the former remaining in a state of bachelorhood, but having failed to utilize these methods, the scientific remedy in both cases—supposing resistance in one, and expense in the other to be the only evils—is to remove the surplus relays from the circuit, and the surplus number of idle members from the family.

And as I view the question,—still assuming that great circuit resistance is the only serious evil,—if we must by circumstances over which we have no control, retain a multitude of relays in the same circuit, there is great advantage in keeping the ampere turns or magnetizing power as high as possible, for the same reasons which would induce us to construct lightning circuits in such a way that the receptive devices shall collectively have a much higher resistance than that of the line portion of the circuit, viz.: to concentrate the major part of the fall of potential in the instruments; or in other words to condense the energy expended, or the work done, or the Watts, in the receiving devices, and not in the line wire.

The parallel connection mode of cutting down relay resistance must now be specially considered, since it is evident that it accomplishes something more than superficially appears. It is not a new idea by any means. First suggested by Henry in his early experiments, it was patented August 16, 1870, No. 106,418, by our own old friend, William Wiley Smith who, however, apparently saw nothing more in it than the decrease of circuit resistance. It has been employed in the British Post-Office Telegraph relays for a long time, and has been publicly advocated by myself as a good way of connecting telephone polarized bell spools at way stations.

But, if it effected nothing more than the decrease of resistance, I doubt whether the change would be worth while, in view of the fact that by making it we cut the amphere turns in half. But there is something more to which we cannot, and must not, shut our eyes. Every relay has to be considered not only as a signal receiver, but likewise as an electro-magnetic resistance through which all of the current pulsations of the circuit must pass. Each relay is indeed a small dynamo, with one winding, serving both as a field and armature winding, and every time its core is magnetized or demagnetized by the opening or closing of a key, the coil surrounding such core has a current generated in it by self-induction (each turn inducing a current in each neighboring turn), which current is in opposition to the line current when the circuit is closed, and in coincidence with it when the circuit is broken, and as this occurs at every relay on the line, the combined effect is quite pronounced, and operates to make the line current slow in reaching its full strength when the circuit closes, and slow in losing its full strength when the circuit breaks.

The iron of the cores also possess magnetic inertia which tends to make them slow in acquiring and parting with magnetism.

In the case of a telegraph line with many relays, it is easily conceivable that the combined effect of these factors becomes so serious that it is distinctly advantageous if it can be eliminated, even at the expense of a loss of half the ampere turns of every relay, or in other words, that the advantage gained by connecting the relay coils in multiple—taking everything together—to-wit, the decreased resistance, the decreased magnetic inertia, and the marked decrease in self-inductive opposition, by far outweighs the loss of ampere turns necessarily accompanying such a change, and this circumstance is in all probability the real key to the resultant improvement noted by Messrs. Fry and Ryder.

It is customary for experts to explain the improvement resulting from such a change, by saying that it tends to reduce the "time constant" of the instruments. This explanation is true enough, but the trouble with it is that it doesn't explain anything. When we say that the time constant of a relay magnet is reduced, we mean that it allows its magnetizing current to rise to a certain definite fractional part of its maximum and final value, in a shorter period than was the case prior to such reduction, that the receiver is thus rendered much more susceptible to the very first impulses of the received current than it would be with a series arrangement of its coils—and gets rid of the effects of its final impulses also quicker.

For in the first place, the parallel connection of all the relay spools of the circuit reduces the electro-motive force of the retarding and prolonging self-induction current in each spool, and thus diminishes the opposing effect 50 per cent, this reduction in a large number of relays, and of course in the main circuit, amounts to a very important quantity; in the second place, the magnetic inertia of the core is reduced and its capability of magnetic change quickened by allowing each spool winding to act upon a portion only of the core; and in the third place, the parallel connection of the two spools of each relay probably enables each to serve as a shunt for the other so that a short local circuit is formed of the two spools in which, since the resistance of such short circuit is so much less than that of the line, the self-induction currents, in part at least, neutralize each other.

The second of these advantages would be still further amplified by suppressing the iron bar which ordinarily connects the two branches of the core.

Culley's Handbook of Practical Telegraphy, suggests an alternative method of relief, which I think might be an improvement in practice, by saying: "A shunt may be placed across the ordinary coils at intermediate stations, to reduce the resistance of the circuit, for it seems that even if nine-tenths of the current are diverted from

the coils by the shunt, the remaining tenth will give better signals than the whole current in a coil whose convolutions are reduced to decrease the resistance.

The small proportion of current passing through the shunted coil, multiplied by its greater number of convolutions, gives a better signal than the entire current less multiplied."

As to the location of battery, I may say, that the first line on which I ever worked, was a circuit from Toronto to Ottawa, Ontario, and it had a battery at both terminal stations, and also a way battery at Kingston, about 100 miles from the latter terminal.

It is unquestionably a good plan so far as operation is concerned, to distribute the battery power of a long line.

I quite believe that were it not for the inertia of the average telegraph man, and the greater instability of the polar relay, we might often work polar relays operated by reversals with profit and advantage. But I think an attempt to generally introduce such methods and apparatus would be likely to fail, because the why and wherefore is a sealed book to the said average operator.

A paper as long as this one should, in my opinion, be summarized, in order that there may remain no doubt concerning the opinions and convictions of the writer, and I therefore now recite my conclusions.

1. Ampere-turns are what we must rely upon to secure magnetizing power. We must in any case to have good results, have a liberal allowance of ampere turns.

2. We cannot have a sufficiency of ampere-turns if we undertake to reduce the resistance of relays, by simply giving them a straight or series low resistance winding, because the magnetizing power of the average telegraphic circuit current is never too great, and we lose in magnetic strength more than we gain in the main current by the resistance reduction.

3. Resistance of itself has no special significance. If we could have a relay of a sufficient number of ampere turns, it would be all the better if it were totally without resistance. But a specified resistance is a measure of a given winding, because the resistance of a wire is proportionate to its length.

4. It is bad practice to connect up a great number of relays in a single circuit.

5. It is bad practice to attempt to relieve such a circuit by connecting with it relays of low resistance, made so by a series winding of coarser wire.

6. The standard 150 ohm relay is a good average instrument for an average circuit and is based on experiments embracing a number of average conditions.

7. It is extremely bad practice to have high resistance and low resistance relays in the same circuit. Whatever the resistance of the

relays employed, that of all should be uniform. One relay having a relatively long winding placed in circuit with a number of relatively short windings, will itself work well, but at the expense of the others, whose efficiency will thereby be depreciated.

8. If a plurality of lines are worked from the same battery, all should be of substantially the same resistance, even if the shorter or lower resistance ones have to be brought up by adding artificial resistance

9. The circumstance that a line having relays which have had their resistance decreased by multiple connections works well, is no proof or evidence that a line of like dimensions but with relays of like low resistance, and the winding serially arranged, will also work well.

10. The so-called law specifying the relative proportions of line and relay resistance, has little force under practical conditions, further than indicating the impropriety of loading a single line with too many stations and relays.

11. To change the relays of a line having many stations, so that their spools are joined in parallel, reduces the ampere turns of each relay 50 per cent.

12. Such a change, however, in adition to reducing the resistance of the several relays to one quarter of what they were before, largely decreases also the counter electro-motive force of self-induction and the magnetic inertia of each relay, the time constant of the relay being thereby reduced. And as all relays are in the main circuit, the operation of the entire circuit is improved.

13. For these reasons it is conceivable that in a line of many relays, the advantages accruing from the parallel connections of the relay spools may outweigh the accruing disadvantages.

14. When, therefore, a line is overloaded with relays, and relief by transferring a portion of the relays to other lines is inadmissible, the plan of connecting the spools in multiple and of thereby reducing the resistance and reactance of the relays is the most promising and feasible, and its adoption, generally speaking, will be attended by good results

15. To leave the relay magnet spools unaltered, and to shunt them by a resistance,—is a plan which is well spoken of, although I have not tried it. It could scarcely fail to be satisfactory if a switch were place in the shunt, so that the shunt of any particular instrument could be opened, to admit of the full operation of the maximum number of ampere turns, while such particular instrument is being employed in receiving a message.

16. To place a portion of the battery power at a way station would —provided they were properly cared for,—ordinarily be of advantage.

17. The introduction of polar relays, and operation by reversals under present conditions, is not desirable.

Mr. Lockwood: Mr. President, I may have a few words more to say, but I think it would be better if I should say them after the members who wish to say anything regarding this paper and the report of the Committee have stated their views; but I wish to make this statement, that if I had seen the report of the Committee before writing this, and had the opportunity to study it, I should have placed very great weight indeed upon the report, and not unlikely might have modified some of mv views very materially. And I wish further to state, that the conclusions which stand at the end of this paper, need not be regarded as dogmatic, nor need it be considered that any of them may not require to be changed by practice or experience, or else after examination of the reports of the experiments of others; some also are subject to modification from information subsequently received.

President: Gentlemen, you have heard the reading of Mr. Lockwood's most important paper. The subject is now before you for discussion. I hope the discussion will be full.

President: Mr. Lang has had some experience; suppose he tell us about it.

Mr. Lang: I have listened to this paper and the report of the Committee with a great deal of interest for the reason that I found on one of my train dispatching circuits every relay of that character but am unable to find out so far just who did it, and how it was done, and when it was done, but I found it so. The Chief Train Dispatcher said it was done by the Signal Foreman a good while ago. The Chief Train Dispatcher also says that while it was impossible to work their line in bad weather, previous to the change of relays, they now have no trouble and never know when it rains. That has been my only experience; it has been very limited.

Mr. Lockwood: May I ask what kind of relay you refer to?

Mr. Lang: It was the standard relay connected in multiple. I have promised Mr. Fry to try to find out just when the change was made and let him know.

Mr. Selden: At the place where we held our meeting a

year ago, when this matter first came up I related my experience. We had a line from Baltimore to Philadelphia, about 95 miles with 62 offices at that time, and the insulation was nearly right as we could get it. It was way above the ordinary standard in our general run, but when we got a foggy day it was almost impossible to work the line. "A" and "C" could work together, but "A" could not get further, while "B" could reach as far as "E" repeating one after the other, showing that the current passed from one end to the other of the line. We put those instruments in multiple, they have been so since and you cannot tell the difference between a bright day, as far as the work of the wire is concerned, and a very miserable, nasty day. The insulation of the line is the same as it was before, it has not been changed, and I thought I could do the same upon another wire about which there was a great deal of complaint. The wire extended from Grafton to Cumberland. I split those relays. Well, in fine weather it worked fine and in bad weather it worked a little bit better, not much. I afterward found that the wire was thirty-two years old and it was like a string of shingle nails that had been melted together. I do not think that any rule laid down will fit in every case, but I do believe this, that on many lines which are working to-day giving you a great deal of trouble, if you put your relays in multiple you will work with a great deal of pleasure. I believe there is another thing however, which comes in with my Grafton and Cumberland line, whereas those relays would not give me the best satisfaction, they appear to give good satisfaction. I should like to hear the experience of anyone else.

Secretary: How many relays?

Mr. Selden: 23, distance 21 miles.

President: Same number still on?

Mr. Selden: Yes, sir.

Mr. Ryder: I would like to ask a little more about the new relays you mentioned—the 150 ohm relays you have just ordered. Do I understand you to say that the wire in the two coils in series

would only measure 150 ohms, or would it measure 300 ohms and 75 if connected in multiple?

Mr. Selden: A straight relay measuring 150 ohms, each coil measuring 75. In multiple the joint resistance would be 37½ ohms. If, however, you take the wire measuring 150 ohms and divide it in one half and then wind on side by side, you would have the same resistance as in the first place, would you not?

Mr. Ryder: Why should not the law of joint resistance apply?

Mr. Lockwood: It does.

Mr. Ryder: It would measure 37½ ohms unless I am mistaken.

Mr. Selden: You are right as far as the measurement is concerned. There is a difference, however, in the magnetic action of the coils.

President: Mr. Sholes has had some experience with multiple relays. Is he here?

Mr. Sholes: On a very limited experience. I have a circuit of 134 miles, working 19 relays. I, myself, went over the line and split all of these relays, since which time I have not given the matter any personal attention, but the wire works all right I am told.

President: Have you any data as to the current on the line?

Mr. Sholes: We take our power from the Western Union, and I did not change that. I have not tried the plan on more than this one circuit though I shall try it elsewhere as soon as I can get around to it.

President: Mr. Swift is a man of wide experience.

Mr. Swift: I have no experience whatever with multiple relays, except those that are ordinarily in use, and cannot give any information. I have not experimented with anything.

President: The West Shore at one time used a special relay of some sort. I am not quite certain just exactly what it was. Will Mr. Taylor explain it to us?

Mr. Taylor: In Mr. Stewart's time we tried the use of a 50 ohm series wound Hughes relay, and are using one of them

now between Weehawken and Suspension Bridge. We had it in for experiment when I left home and it was working very well, and we have had them in at several other points. I do not think, however, that during bad weather we found them entirely a success. Mr. Fry has some instruments here, a 25 ohm series wound pony relay, a 25 ohm aluminum sounder, and 150 ohm multiple relay. We took them up yesterday afternoon and put them in our circuit between Suspension Bridge and Weehawken, a distance of about 454 miles. There should have been about sixteen offices in the circuit, and we found that with any one of those instruments we got very clear signals; I think we got them a little clearer on the multiple relay and the sounder, although possibly there was a little difference in adjusting; we got clear signals however, from all.

President: The multiple relay was 37½ ohms, 150 divided. This 50 ohm relay that you speak of, did you ever equip a line fully and with what results?

Mr. Taylor: No, I have not carried the experiment out far enough. I think you cannot make a successful experiment without doing that.

President: I understand Mr. Kinsman of the Wabash has had some experience with multiple relays.

Mr. Kinsman: Hardly sufficient to make it of much value. At the request of Supt. Ryder we tried the 25 ohm series wound pony relays in a circuit 70 miles in length; the resistance of the wire with nine 150 ohm relays in circuit was about 495 ohms per mile. It is a No. 8 gauge iron wire strung about twenty-five years ago, runs full size and looks well, but measures high notwithstanding the joints are soldered. This high resistance is accounted for by the man who put it up by saying that the wire before it was strung was in a fire and the life burned out of it. We took the nine 150 ohm relays out and put nine 25 ohm relays in. The relays worked, but hardly to a sufficient extent to exchange signals. Neither did the 150 ohm relays work to an extent to enable us to get service except in the best weather, probably for the reason that the battery was insufficient. We have lit le

use for the wire and it practically lays dead. We also tried a few of these relays in principal offices at different points in another circuit 110 miles long with twenty-eight 150 ohm relays normally in circuit, the combined resistance being about 8,000 ohms. The verdict was that the service was not improved.

A Member: Did I understand the resistance in the last case to be 8,000 or 80,000 ohms?

Mr. Kinsman: 8,000. The offices that had the low resistance relays made some objection to them; the margin was very low; they were placed at principal train order points, the 150 ohm relays being taken out and the 25 ohm relays put in.

We also tried the multiple relays on that 70 mile high resistance line something like a year ago without any material change in the conditions that we could see, the service apparently being about the same as before.

Mr. Selden: Could you state what current you had on that line?

Mr. Kinsman: I think Mr. Ryder has that tabulated somewhere, 35 cells at one end and 100 at the other, if I remember.

Mr. Ryder: From the figures given me by Mr. Kinsman, I find they are getting not quite four milliamperes of current.

One day Mr. Kinsman was in my office and mention was made of this excessively high resistance wire. He stated the wire was practically of no value to them as it was almost impossible to get any signals over it. Our experience with the 25 ohm relays had been so remarkable I suggested his trying them on that wire thinking we had nothing whatever to lose, and possibly something to gain if they should work. At that time, however, I did not know there was so little battery on the line. The fact that they did not work successfully proves nothing under the circumstances, and in fact I think we have reason to congratulate ourselves that they worked at all.

I am surprised that better results were not shown when the relays were put on the second wire as this is the first case that has come to our attention where an improvement has not been shown through their use.

The same relays after being returned by Mr. Kinsman were offered the Illinois Central people and I would be glad to hear from Mr. Annette as to their experience.

Mr. Kinsman: I wish to add that I placed one of the 25 ohm relays received from Mr. Ryder in a circuit 290 miles long, No. 8 gauge iron wire, measuring with eight 150 ohm relays in circuit 7,000 ohms. I kept that on my desk for several days. It worked beautifully, the signals were sharp and strong. I cannot say as to current as we get our battery from the Western Union. It is dynamo battery at either end.

Mr. Annette: I would like to answer Mr. Ryder. I took nine of the 25 ohm relays one week ago this morning on our St. Louis "Daylight Special;" I left two of them at Clinton, Ill. (train only stopped five minutes), and instructed our Manager there to put in one of the relays on train wire between Clinton and Centralia, 117 miles. I went to Decatur and put in one on the same wire; the balance of them I distributed between Centralia and Decatur. On same evening I returned to Clinton and asked the operator on duty how the two relays were doing. "They are not doing well at all," was his answer. I examined them and found the armatures were adjusted about one eighth of an inch away from the magnet cores. I changed the adjustment by getting them very close, which made a big difference in the working of them, and on the following morning when I came to the office, the night operator reported that they "worked fine all night." I went south again and got a favorable report from the other offices. Of course it is only one week since we have been trying them, but all say they are a big improvement over the 150 ohm relay. We will keep on trying them.

Mr. Selden: It seems to me in the discussion as far as it has proceeded, that the experimentors have not given the thing a fair trial. It is not fair to put a relay wound as the Committee suggest in a circuit with other relays wound in the ordinary way; it is practically equivalent to putting a sounder in the same circuit with ordinary relays and expecting it to work; therefore it seems to me that our experiments have not been what they

should be. Of course if you should send a low resistance relay to man to be put on a line where there are a lot of high resistance instruments, that man would say it would not work.

Mr. Swift: Mr. President, I would like to read a letter sent me by one of my men. I asked no comments from him, but he sent me a letter which I would like to submit without any idea of any discussion. If the President thinks it proper I would like to have Mr. Drew read it to the members.

Mr. Fry: Mr. President, if Mr. Swift will allow me, I would like to say in reply to Mr. Selden that we are now doing exactly as he thinks we should do. Take a little relay or a multiple relay, place it on a circuit with forty or more 150 ohm relays, making a total resistance of 15,000 ohms. Now if the little relay or the multiple relay will work with any degree of satisfaction, we ask what would it do if all instruments were changed to 25 ohm relays and the total resistance thus greatly reduced? Mr. Ryder has equipped an entire circuit with these 25 ohm instruments, and I understand they are giving entire satisfaction. Relative to our multiple system, I wish to say that prior to the re-arrangement of our most important dispatchers' wires complaints were made to the effect that trains were being delayed by reason of the wires not working well during bad weather. Since the change, I am pleased to state that I have not heard of a single train having been delayed a moment by reason of bad working wires in bad weather. Our Train Dispatchers all report that they are able to work these wires with a greater degree of ease than with the old system, the reasons for which have been fully explained.

President: You mean then that they were not low resistance relays?

Mr. Fry: You understand the telegraph company furnish instruments to us for all our lines, and as yet they have not furnished the 25 ohm or multiple relay.

Secretary: I had a similar experience to that of Mr. Kinsman if Mr. Ryder will allow me to relate. I have a circuit of 510 miles, all copper except a loop of 55 miles which is No. 8

iron. We have twenty relays upon that circuit. The wire measured with the relays in 7,600 ohms. Mr. Fry two months ago sent me a 25 ohm relay to try in my office, which is about 125 miles from the Chicago end of the circuit with about one third of the relays between it and Chicago. We gave it a very thorough test, the relay still being in use. My Chief Operator, one of the best men I ever had in my employ, is very much pleased with the working of that relay. To put it in his own language he says, "It works so much quicker than the 150 ohm relay that it seems as though I was working a short circuit." He is a very rapid sender, and when he gets on that circuit with that little relay the fellow at the other end has to attend strictly to business. I hardly know how to account for it. I supposed, of course, a relay of so small resistance as that would naturally work lighter than the 150 ohm instrument, but it does not, it works beautifully, which is a great advantage. Of course, in a line of 500 miles in length, you strike very frequently in summer weather storms that may extend 20, 30 or 40 miles over that line or some portion of it, which will change the adjustment of the instruments working upon it. When such a condition occurs the necessary change in adjustment on that little r lay is so slight that it is very much easier to adjust it than the high resistance relay was, taking perhaps only a sixteenth of a turn to adjust it, whereas on the 150 ohm relay you would have to turn the thumb screw once or twice around. That has been our experience during the past two months.

Mr. Ryder: I would like to hear the letter from Mr. Swift s General Foreman before we carry the discussion further. It may bring out some points that could be answered at once.

Mr. Swift: I do not wish to enter into any discussion at all.

Davenport, Iowa, June 12, 1897.

A. R. SWIFT, ESQ., Supt. Telegraph, Chicago:

DEAR SIR—Referring to the report to be made before the convention of Telegraph Superintendents, by the committee on the multiple relays, and pony relays; also their tests of different circuits, and improvements found in same; I believe the improvements found has been on account of the wires having bad insulation, so that in

bad, damp weather it has caused partial ground, which would effect a sensitive relay and compel higher adjustment, but by a low resistance relay it would not be felt as much, providing there is battery enough to force a current through the escape to give impulse to the relay. To illustrate: you can work a low resistance relay on a rail circuit and not feel the escape, but if a high resistance relay is used it will stay closed despite the opening and closing of the circuit. Had their wires been perfect or nearly so, I think the result would have been different.

Following are some of our railroad circuits and their ability:

FIRST—No. 11, Train Dispatcher's wire between Chicago and Davenport; with loops is 188 miles long; 46 relays; 150 volts at Chicago; 160 cells at Davenport, feeding 7 wires; works good in all kinds of weather.

SECOND—No. 11, Train Dispatcher's wire between Davenport and Des Moines, with loops to Rock Island and Valley Junction; 189 miles long; 34 relays; 160 cells at Davenport; 130 cells at Des Moines; works good in all kinds of weather.

THIRD—No. 6, between Chicago and Omaha, with loops; 510 miles long; 36 relays; 150 volts at Chicago; 140 cells intermediate at Des Moines; 200 cells at Omaha; works fine; wire 20 years old.

FOURTH—No. 5, between Chicago and St. Joseph, with loops; 508 miles long; 27 relays; 150 volts at Chicago; 200 cells at St. Joe; work in any kind of weather; 10 years old.

FIFTH—No. 5, local between Washington and Knoxville, with loops; 81 miles long; 14 relays; 40 cells at Washington; 30 cells at Knoxville; works good; over 20 years old.

SIXTH—No. 1, Train dispatcher's wire between Des Moines and Keokuk, with loops; 160 miles long; 31 relays; 150 cells at Des Moines; 170 cells at Keokuk; 30 years old, have to bridge all connections in making them; estimate in for renewal.

SEVENTH—No. 33, between Davenport and Kansas City, with loops; 345 miles long; 30 relays; 160 cells at Davenport; 150 at Kansas City; works good.

EIGHTH—No. 2, between Trenton and Herrington, with loops; 351 miles long; 34 relays; 150 cells at Trenton; 170 at Herrington; works fine.

NINTH—No. 6, between Topeka and Colorado Springs; 556 miles long; 32 relays; 250 cells at Topeka; 140 intermediate at Goodland; 150 cells at Colorado Springs; works fine.

TENTH—No. 8, between Herrington and Ft. Worth, with loops; 452 miles long; 62 relays; 150 cells at Herrington; 200 cells at Ft. Worth; works good.

ELEVENTH—No. 1, between Herrington and Liberal, with loop to Dodge City; 320 miles long; 36 relays; 125 cells at Herrington; 240 cells at Liberal.

I have given above 11 circuits, showing length, number of relays, battery, etc., on each wire. The battery in all cases feed two to seven wires. In many cases they feed wires not over half the length of our wires.

As to the working of these wires; you know their capacity better than I. Yours truly,

F. A. LOUDEE.

President: I would like to inflict on the members the result of an experiment we made on the Lehigh Valley. The equipment of our No. 8 New Jersey train wire, distance 80 miles is as follows:

OFFICE, SUPERINTENDENT TELEGRAPH AND SIGNALS.

May 31st, 1897.

Equipment of our No. 8 New Jersey Division Train Wire between Jersey City and Easton, distance eighty miles, with Multiple Relays.

Relays used, the ordinary 150-ohm with the two coils connected in multiple, making a resistance of 37½ ohms each.

Number of relays in circuit, 32.

Resistance of wire, 3,200 ohms, 40 ohms per mile.

Resistance of line with old relays, 7,000 ohms.

Resistance of line with multiple relays 4,400 ohms.

Current on line with old relays, 29 mil-amperes.

Current with multiple relays, 45 mil-amperes.

This equipment was completed on February 17th, 1897, and although we have had heavy rains of several days' duration, with heavy atmosphere, frequently since that time we have, up to this date, experienced no difficulty, whatever, in adjusting. The improvement in the service is very marked. Previous to the time of this change the wire became so heavy in wet weather as to make it almost useless, the offices at the extreme ends not being able to adjust for each other.

We have 110-volt Edison incandescent current at one end and 85-volt accumulator battery at the other. Voltage was not changed when this line was so equipped; the cost of increased current amounting to only about seven cents per month.

Just before I came away I wrote to the Train Master of that Division to ask him what their experience had been with this wire which had been worked under the new system since February.

LEHIGH VALLEY RAILROAD.

Message Blank.

So. Plainfield, 5-17, 1897.

Garret Brodhead, Esq.
Trainmaster,

Dear Sir:—No. 8 worked all right during the heavy weather of last week. We had no trouble in working with any of the offices.

Yours very respectfully, JNO. H. SULLIVAN.

The Dispatcher said No. 8 worked all right during the heavy storms last week. We had no trouble.

When you take into consideration the self-induction of the wire on the relay, the magnetic inertia of the cores of the magnets, and all the other conditions that accompany lines extending over long districts, I am satisfied that there are some cases, at least, where it is better to connect your relays in multiple after this form, than it would be to have the 150 ohm relays in singly. I do not believe, however, that it is as good to have the standard sized relay with the 150 ohm series wound coils reduced to multiple as it would be to have a lower wound relay, as for instance, this one measuring 25 ohms. I am free to admit that with a 25 ohm relay we do not get a large magnetic effect, but if we have enough, any more is superfluous. We had one of these little 25 ohm relays in circuit with a line that would compare favorably with the one I have quoted, on my desk in the office where I could hear it; my experience has been that that relay is a decided improvement and I think that sometime during the coming year I shall purchase an outfit of the 25 ohm pony relays, and fit up the line I have tested it on. One reason why that little relay works better, to my mind, is because the coils are so much shorter that they are capable of charging and discharging at a much more rapid gate, and consequently the signals on the line must be more clear and sharp. So long as we have sufficient magnetic effect in the cores of that relay to produce the movements occasioned by the opening and closing of the circuit, that is all we want, and as I said, any more than that is really unnecessary. If you have enough current for you 25 ohm relays, I believe in every case you will get better results than you

do now with your 150 ohm relays, and at the same time make a substantial reduction of current on the line so equipped.

Mr. Ryder: I would like to make a few remarks in reply to the criticism which has been made regarding the fairness of the experiments. We have at present on the C. B. & Q. thirty-one wires equipped with multiple relays. These wires vary in length, resistance, insulation and number of offices in the circuit, but on all of them are a great many offices. Every single one of these wires is working better to-day than it ever worked with the series wound relays. Nothing has been done to improve the insulation of the wires which tests have shown to be up to the average.

In this connection I wish to call your attention particularly to the fact that on all of these wires a large proportion of the relays are of the "box" pattern. I think you will all agree with me that if an improvement is shown through connecting the coils of the box relays in multiple, certainly better results can be expected if the same scheme is applied to open relays.

On the first dozen 25 ohm pony relays purchased, nine of them were placed on three train circuits, three on each. On one wire the dispatcher's office was at one terminus. One of the little relays was put on the Dispatcher's desk, and the other two were placed equally distant from each other and the termini. On the other two wires the Dispatcher's office was in the center, and we placed a relay on the Dispatcher's desk and one half way to the terminus on each side of him. The remaining three were tried on various wires which I will not attempt to mention in detail. The results obtained through these experiments were extremely gratifying, and it was then decided to completely equip a wire with this style of relay. Accordingly thirty-six instruments were purchased and placed on the train wire which is mentioned in the Committee's report as No. 6. Our expectations were more than realized, the wire working perfectly satisfactorily under all conditions of weather. I happened to be at one terminus of this wire not long ago, one extremely foggy night, and thinking that trouble would develop then if ever, spent some

time in the office listening to the working of the instrument. I called up the distant office 160 miles away and got them without trouble; I then called an office only two miles away and got them on exactly the same adjustment, and in fact the adjustment of the instrument was not changed while I was in the office. Upon inquiry I found that the weather conditions were the same over the entire 160 miles, it being as thick and foggy a night as I have ever seen.

Early in the present year sixty more pony relays were purchased and placed in the most important offices on various train wires. Some of these wires are equipped with the 150 ohm relays connected in multiple, while the others have those series wound. The results from their use have been such that were I buying equipment for a wire to-day I should buy this particular style of instrument.

The Committee states in their report that they are not prepared to say that the 25 ohm relays are the best that can be designed, but we are getting absolutely satisfactory results from these relays. I believe in the old adage, "let well nough alone," still if there is something better found we should certainly change to that. I made some experiments with the 20 ohm relay of the same design as the 25 ohm instrument, and found that the results were not to be compared with the latter. Possibly a relay of still higher resistance than 25 ohms would give better results, but my idea is that we should keep the relay resistance as low as possible. I think the members will all agree with me that in putting in low resistance instruments on a wire equipped with those of higher resistance it is not a question of the working of the latter, it is how will the low resistance instruments work, and our experience has shown that the low resistance instruments are much the better.

I must take exception to the remark made a few moments ago that the placing of one of these low resistance instruments in a circuit was equivalent to placing a common sounder in the same circuit. In the first place, there is a very great difference in the mechanical construction of the two instruments, the arma-

ture bar of the relay being extremely light as compared with that of the sounder, while there are also a great many more ampere turns on the small relay. As a matter of fact, Mr. Taylor a few moments ago mentioned an experiment he and Supt. Fry made yesterday where a 25 ohm aluminum bar sounder was placed with other instruments on a through circuit and worked extremely satisfactory.

There was one statement made at the last meeting in connection with the use of the multiple relays which was an error, and should be corrected. It was our opinion that the electromotive force of the battery on a line equipped with multiple relays could be reduced one-half and still get the same ampere turns, but this was a mistake and our practice since has been to let the battery alone. We have found that changing the relays on an average circuit to multiple reduced the total resistance of that circuit about one-half. This with the electromotive forces unchanged will give twice the current which will offset the reduction of the ampere turns of the relay through its multiple connection.

There is a great difference in the mechanical construction of the 25 ohm relay as compared wih the present standard relay. The cores and coils are both shorter, the effect of which has been mentioned by our President. There are 1,025 convolutions of No. 28 wire on each coil making 2,050 convolutions, while the standard relay averages 7,950 convolutions in each coil. The armature is extremely light, practically all unnecessary metal being cut out of it, consequently it will respond to a much smaller current than will the ordinary relay.

There is one more experiment made recently to which I would like to call your attention. One of these small relays was placed in the Chicago Western Union office on a circuit 315 miles long, measuring 14,600 ohms and carrying a normal current of 19 milliamperes. There were 45 offices on the circuit, each equipped with 150 ohm standard relays. The small relay was in that circuit for about six weeks, and shortly before it was taken out a distant office, very nearly the most distant one,

called up the operator at Chicago and said, "The old man wants to know what kind of a relay you have at "C. H." We have noticed that you are always in adjustment, and we have wondered if you have anything new." The men at this distant office knew nothing whatever about this experiment, but they had noticed "C. H." was always in adjustment and was the only one out of the forty-five that was. This speaks for itself.

Mr. Lockwood: There seems to be, Mr. President, no further discussion offered for the present, and I really have very little more to say since the members who have spoken appear to have very successfully answered one another. I thought when I finished my paper that I might possibly have to own up to some quite material modifications of some of the views expressed in my paper, but now that we all have had an opportunity to understand one another better, I find that we are not any of us very far apart from the others.

The gentlemen of your committee apparently agree with my principal proposition, namely; that the main thing is ampere turns. Mr. Ryder has pointed out that in one of the original experiments, the battery which was said to have been reduced was in fact not reduced; and thus in that experiment the further decrease in ampere turns which is mentioned in my paper, did not occur. Now, as long as we have a sufficiency of ampere turns, I do not care, and you need not care, whether we get them by a parallel wound or a series wound relay; and if we can get them by a series wound relay, other things being equal, that certainly is the best because we get rid of an undesirable double connection.

Mr. Selden has already remarked upon one of the points of which I intended to speak, and has suggested that in telegraphy the maximum of magnetic power is not a vital necessity. It is however, highly important that we shall have a sufficiency of magnetic strength, and still more important that we shall have quickness of action. Here I would like to say that I have quite reached the conclusion that to hold on stubbornly to a particular size, length and resistance of relay wire over other magnitudes,

simply because it has been handed down to us, is not a progressive procedure; and I fear that in the past many of us have pinned our faith to the 150 ohm relay because it has been given to us. I fully believe that if the experts, who in their time made that standard, were possessed of the very changed conditions of our times, they would be as ready as we to reconsider.

We shall all agree that good insulation is one of the prime requisites for success. There are several such prime requisites and this is one of them. For to have a first-class line good insulation must be supplemented by a first-class conducting wire, and this by instruments designed to fully utilize the conditions of such wire and insulation; and we should not rest contented until we have all of these. We have not yet reached the top, but it is undeniable that on an average the line wire is better now than it was twenty-five years ago; while the insulation is incomparably improved.

So then the conditions of the present time are quite different from those at the time when the 150 ohm relay was fixed upon as the standard; and it may very well be that in view of such changed conditions the time has come for a revision of standards.

Mr. Chairman, I am convinced that your committee is on the right track, and believe it should be continued for another year to continue its experiments, and to report further at the next meeting of the Association. I do not think the committee or its members should stand out for a 25 ohm relay, in preference to relays of any other number of ohms. It is true that Mr. Ryder has mentioned that 25 ohm relays have worked well, but possibly if he tried 40 or 50 ohm relays he might find that he was best satisfied with the 50 ohm relay. It is a pretty long distance from 150 ohm to 25 ohms at one sweep.

Time has not stood still, and it may be the time has come when a new standard is required, and when a new standard ought to be forthcoming.

No one twenty-five years ago knew what many of us know now, that the impedance of a relay is to be considered as well

as its resistance, and that decreasing this by decreasing the length of the winding we may often make a great improvement.

Even though we cut our relay windings down to 50 ohms, we may frequently by leaving our battery power unchanged maintain such a current as will give a sufficiency of ampere turns, by reason of the total decrease thus brought about in circuit resistance; and such loss as is experienced may very possibly find compensation in the advantage of lower inductance which is thus secured.

So, it is not unlikely, taking all of the conditions into consideration, that the improved line conductors, and improved insulation of the present, we no longer need the high resistance relay or anything like it.

As I understood Mr. Selden's description of the relay with which he had experimented, it does not materially differ with other relays which have been described. I understand that he took a one hundred and fifty ohm relay, cut its winding in the middle into two sections each of seventy-five ohms, and connected these two in parallel, so that the joint resistance of the entire relay was thirty-seven and a half ohms. This, as I understand it, produces a relay substantially identical to some of those mentioned by the Committee. Unquestionably, relays so made are good for a line of many stations, provided all of the stations have them.

I would like to conclude these remarks by making a motion that the Committee be continued another year, and proceed with its experiments; and that it be suggested to its members that windings of other sizes of wire should also be tried; embracing resistances say up to 50 ohms.

Motion seconded. President: It has been moved and seconded that the Committee be continued for another year. Are you ready for the question?

Carried.

President: I wish to say that I shall be personally very glad and willing to assist the Committee by carrying on any experi-

ments that they may wish to suggest. I will use our lines for it freely and gladly.

President: As we have only ten minutes to adjournment, the Chair wants to announce the following committees:

On Arrangements—W. W. Ryder, H. C. Hope and C. P. Adams.

On Topics—G. C. Kinsman, C. S. Rhoads and S. K. Bullaid.

On Annual Dues—C. Selden, A. R. Swift and U. J. Fry.

President: The only other thing that occurs to me at this time, which it remains for us to attend to is the report of the Committee on Courtesies. If that Committee is ready to report we will be glad to have that report.

Mr. Magiff: We thought we could present our report at the next session. The Committee has had no meeting. I suggest that we can make our report and hand it to the Secretary.

President: If there is no objection that will be the arrangement. In regard to the trip down the Gorge road, we have just heard from the road on the opposite side of the River to the effect that the members of this Association can come there at any time, exhibit their badges and have the benefit of the reduced rate. As to the trip down on this side of the Gorge, I think possibly we can secure the same arrangement, but I cannot state this positively; I will see Mr. Brooks immediately after the close of this meeting and will cause the members to be informed after lunch. The trip up this side includes the trip up the Tower, which it seems to me is a new thing to most of us, and also a trip down the Gorge. I think very likely that they will allow on this side to present ourselves individually and still get the benefit of the rate, but I cannot state this positively.

I also wish to call the attention of the members to the fact that they can get carriages from Miller & Brundage's Livery at the prices advertised. Since they were kind enough to offer these courtesies, I hope those who feel inclined to take a carriage ride will patronize them.

Mr. Foley: I would like to know if we will have another session after we adjourn now.

President: I know of no occasion for another.

Mr. Foley: I would like the Association to appoint a committee on Membership with a view of having all the roads in the United States represented in the Association, and to find out what the sense of the meeting is on that point.

Mr. Ryder: My idea is that we should have every railroad in the Union represented. The question however, is how to arrive at that result.

Mr. Rhoads: It seems to me that we ought to have more members. I never made much of an effort; there might be a number of men on one railroad system; at this time we have two Chief Dispatchers who are members; one was elected at this meeting, but I think I can get a number of them in addition to those here. There are others who are able to do so.

A Member: Who are eligible for membership?

President: I understand that everyone who is an active worker in the telegraph department.

Mr. Rhoads: My understanding is that any one who has charge of or hires operators. All our Chief Dispatchers would join I am sure.

President: We would be glad to have them all.

Secretary: They are just the class of men we want to get in this Association. They have the direct handling of our wires, and we therefore extend a most cordial invitation to all of the Dispatchers that the Superintendents of Telegraph can bring into our Association. We want to cultivate, it seems to me, a closer relationship with those men, and we would certainly be glad to have them represented here in our meetings. They would get a great deal of benefit no doubt, and we would receive corresponding benefits from them.

President: I think the better thing to do would be for each member, say during the coming year, to make an effort to secure at least one additional member. I think we can increase our ranks in that way better than by any committee.

Mr. Rhoads: There is no doubt but that each could bring in at least one additional member, possibly more. I am in hopes

to have that in preference to increasing the dues which was talked over to-day, which might have a tendency to keep some of the boys out.

Mr. Annette: I do not believe in raising the dues; I would rather they would remain at $5.00. The Chief Dispatchers on the different roads can be brought in even if many of the railroads are consolidated and I am in favor of making the dues to them at $3.00.

Mr. Foley: It would be a good idea if the Secretary would mail to the General Manager of each road a copy of the proceedings.

Secretary: I wish to say in answer to that, our by-laws provide that each member of the Association shall be provided with two copies of the minutes; that second copy, whether he subscribes for any more for his own circulation or not, is supposed to be given to the Superintendent of Telegraph to be placed by him on his own system where he thinks it will do the most good, and it may be that we might distribute some copies advantageously to the General Managers of systems not represented, but I do not know just how that would do. The price is about 25 cents apiece.

Mr. Annette: I move that we adjourn sine die.

Mr. Williams: Continued from last year, there was a Committee on Rules, was there not?

President: I think they made their report.

Mr. Williams: I think that Committee was to see if it could get the American Railway Association to adopt a code of telegraph rules.

Mr. Ryder: This question was discussed at some length at our last meeting, but there was no action taken. This Association had already submitted a code of rules to the American Railway Association, and it was decided that we had done everything we possibly could, and the matter was dropped.

Motion seconded to adjourn.

President: It has been moved and seconded that we adjourn sine die.

Carried.